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ABSTRACT

These instructional materials include a teacher's guide designed to assist instructors in organizing and presenting a unit of study on communication technology and a student guide. The materials are based on the curriculum-alignment concept of first stating the objectives, developing instructional strategies for teaching those objectives, and then evaluating based on the objectives. Topics covered in the teacher section include the following: using Agency for Instructional Technology (AIT) media programs, laser classifications and power ratings, engineering and drafting sketches, using computer-assisted drawing (CAD) systems, and designing a web page. The teacher edition includes the following: suggested activities, learning activities sheet, optional assignment sheets, answers to assignment sheets, teacher supplements, written test, answers to written test, and unit evaluation form. In addition, the teacher edition includes a section on use of the publication, a competency profile, instructional and task analyses, academic and workplace skill classifications and definitions, and a related academic and workplace skills list. The student edition includes the following components of a unit of instruction: objective sheet, information sheet, assignment sheets, lab activity sheets, and student supplements. The following topics are addressed in the student materials: communication careers, nonverbal communication, visual messages, visual design, interference-free messages, coded messages, audiovisual messages, satellite communication, and fiber-optic communication. (KC)

ED 410 413

Exploring Technology Education
Exploring Communication Technology

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Introduction to Technology Education

Teacher Edition

MAVCC

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Exploring Technology Education:

Exploring Communication Technology

Teacher Edition

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Exploring Communication Technology

Teacher Edition

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Foreword

Exploring Technology Education: Exploring Communication Technology is one of five new publications that have been developed to replace MAVCC's original technology education series. The titles of the five new books in MAVCC's current technology education series are

- *Introduction to Technology Education*
- *Exploring Communication Technology*
- *Exploring Manufacturing Technology*
- *Exploring Construction Technology*
- *Exploring Energy, Power, and Transportation Technology*

The changes in the instructional materials in MAVCC's new technology education series reflect the changes that have occurred in industry as a result of emerging technology and the demand for more highly skilled workers who can read, write, find and interpret information, think creatively to solve problems, and then, effectively communicate their solutions to other people. As a result, the students who will use these instructional materials are asked to learn and use strategies for finding and presenting pertinent information and for thinking and problem-solving to complete the assignment and lab activity sheets that are the core of each unit of instruction in the series.

The success of this publication is due in large part to the capabilities of the personnel who worked with its development. Appreciation is extended to them for their valuable contributions to the publication.

These instructional materials are designed for student use and to assist instructors in organizing and improving instruction. These instructional materials are based on the curriculum-alignment concept of first stating the objectives (objective sheet), developing instructional strategies for teaching those objectives (information, assignment, and lab activity sheets), and assessing to those same objectives (written test—a criterion-referenced evaluation instrument).

Every effort has been made to make these instructional materials basic, readable, and by all means, usable. However, as with all of MAVCC's instructional materials, instructors must localize and personalize these materials to meet their community, classroom/laboratory, and individual student's situation. Instructors are encouraged to supplement the instructional materials and to develop strategies for motivating their students.

As you use these instructional materials, we hope that you will find that they contribute to the quality of your program. If any problems occur or if you have any suggestions for improving the materials, please call or write us.

Jean McEntire, Chair
Board of Directors
Multistate Academic and
Vocational Curriculum Consortium

Clark R. Harris
Executive Director
Multistate Academic and
Vocational Curriculum Consortium

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Cleveland, Oklahoma

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Pawhuska High School
Pawhuska, Oklahoma

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Hobart, Oklahoma

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Olustee, Oklahoma

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Program Specialist

Harold Holley
Program Specialist

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Appreciation is also extended to the Agency for Instructional Technology (AIT) for providing the artwork used on the covers of the student and teacher editions of this publication.

Use of Introductory Materials

Introductory materials are included in the teacher edition only and contain useful information to assist administrators and teachers in planning for instruction.

In addition to the general information—such as the table of contents, foreword, and acknowledgments page—information is included on the following:

1. **Use of this publication**—Explains the components of a unit of instruction and how they should be used as part of the teaching/learning process.

2. **Competency profile**—Provides a record of student performance for each task included in a unit of instruction. This profile should become a part of the student's permanent course records.

3. **Instructional/task analysis**—Provides a quick review of the contents of the publication; identifies cognitive (knowledge) skills and psychomotor (doing) skills addressed in each unit of instruction.

4. **Academic and workplace skill classifications and definitions**—Defines the basic-skill classifications used by MAVCC. Skill areas reflected by skill groups, subskills, and descriptions have been identified using *What Work Requires of Schools: A SCANS Report for America 2000 and Workplace Basics: The Skills Employers Want.* These have been adapted by MAVCC.

5. **Related academic and workplace skills list**—Classifies unit tasks (assignment sheets and lab activity sheets) according to the related academic and workplace skills and competencies being reinforced.

As you use these materials, it is hoped that they will provide useful information to meet a variety of needs.

Use of This Publication

Instructional units

The instructional unit in the student edition of this publication includes the following components: objective sheet, information sheet, assignment sheets, lab activity sheets, and student supplements.

The teacher edition includes the following components: suggested activities, learning activities sheet, optional student supplements, optional assignment sheets, answers to assignment sheets, optional lab activity sheets, teacher supplements, written test, answers to written test, and unit evaluation form.

Units of instruction are designed for use in more than one lesson or class period of instruction, all of the unit components focus on measurable and observable learning outcomes, and careful study of the components in both the student and teacher edition for each unit of instruction by the teacher will help to determine the following:

- Amount of materials that can be covered in each class period.
- Skills that must be demonstrated.
- Amount of class time needed for teacher demonstrations.
- Amount of time needed for student practice.
- Supplementary materials, including print and nonprint media and equipment and supplies, that must be ordered.
- Resource people who must be contacted.

Student-edition components

It is a challenge to keep students motivated. Instructors should supplement the student-edition components by providing the "why," personal experiences, and current information. Prepare for each unit by deciding how each of the student components listed below can best be taught, and by allowing students to become involved in preparing and planning their teaching/learning experiences.

Objective sheet. Each unit of instruction is based on performance objectives that state the goals for successful completion of the unit. These performance objectives are presented in two forms on the objective sheet: (1) a unit objective, which states the expected performance of each student after completion of the unit of instruction, and (2) specific objectives, which state what the student must do to reach the unit objective.

The instructor should stress the unit objectives throughout the teaching/learning process. Doing so will help answer student questions concerning performance requirements for each instructional unit. The objectives can also help the instructor determine teaching strategies and instructional methods. Teachers should prepare for each unit by deciding how each objective can best be taught.

Teachers should feel free to modify, delete, or add objectives to an objective sheet in order to meet the needs of the students and community. When objectives are added, however, the teacher should remember also to add the needed information-sheet, assignment-sheet, lab activity-sheet, and criterion-referenced written-test items.

Information sheet. The information sheet provides the students with the content essential for meeting the testable cognitive (knowledge) objectives of the unit; this means the cognitive information presented in the information sheet is tested in the criterion-referenced written test that is presented in the teacher edition for each unit of instruction.

Student supplements. The information presented in a student supplement may consist of tables, charts, written information, forms, or other information students must be able to apply in order to complete one or more of the assignment sheets or lab activity sheets in a unit of instruction. Students are not directly tested over the cognitive information presented in a supplement; however, their ability to apply this information should be evaluated in scoring the completed assignment sheet/lab activity sheet associated with a supplement.

Assignment sheets. The assignment sheets presented in a unit of instruction provide students with pencil-and-paper activities that give students the opportunity to apply the testable cognitive objectives presented in the information sheet and the nontestable cognitive information presented in student supplements. Criteria are provided on each assignment sheet to assist the instructor in objectively evaluating student performance.

Lab activity sheets. The lab activity sheets presented in a unit of instruction provide students with psychomotor activities that give students the opportunity to apply the testable cognitive objectives presented in the information sheet and the nontestable cognitive information presented in the student supplements.

A worksheet is included in each lab activity sheet. The worksheet provides criteria to allow the instructor to objectively evaluate student performance of the particular psychomotor skills presented in a lab activity sheet and also requires the student to check with the instructor to discuss the methods, equipment, and materials the student is planning to use in completing the psychomotor activity in that lab activity sheet.

Teacher-edition components

Suggested activities. The suggested activities component assists teachers during the preparation stage of the teaching/learning process by providing an instructional plan and a list of suggested resources to be used with each unit of instruction.

The teacher should read the instructional-plan section of the suggested activities component before presenting the unit to his or her students and decide how each objective can best be presented, how to obtain supplemental materials required for the unit presentation, and which outside resources will be required for the unit presentation.

The teacher should read both subsections of the "suggested resources" section of the suggested activities to obtain ordering information for books and media to supplement the subject area covered in a unit of instruction.

The subsection called "resources used in developing this unit" lists the books and materials that were used by the writer in doing research for a particular unit of instruction. These materials can be used by the teacher to supplement her or his knowledge of the subject area presented in the unit of instruction or to provide background information to students with particular interests or objectives in the subject area covered in the unit of instruction.

The "suggested supplemental resources" subsection provides ordering information for printed material or media presentations that instructors may want to use to supplement the subject area of the objectives presented in the unit of instruction.

Use of This Publication

Learning activities sheet. The learning activities sheet supplied in each unit is a step-by-step instruction sheet instructors may copy and distribute to students to guide their individual study through the required components in the student edition (objective sheet, information sheet, student supplements, assignment sheets, and lab activity sheets).

Optional student supplements, optional assignment sheets, and optional lab activity sheets. When these components are provided in the teacher edition for a unit of instruction, they are optional cognitive-information sheets, pencil-and-paper activities, and psychomotor activities. These optional activities may be duplicated for student use. They allow the instructor to use his or her discretion in providing students with additional objectives in the same subject area as the required objectives provided in the student edition.

Assignment-sheet answers. Assignment-sheet answers are designed to assist the teacher in evaluating student performances on both the required assignment sheets in the student edition and the optional assignment sheets in the teacher edition.

Written test. This component is a criterion-referenced evaluation of every cognitive objective listed in the information sheet in the student edition. If the instructor has added, deleted, or modified objectives in the student edition, appropriate changes should be made on the written test. The test is included in the teacher edition only, but duplication is permitted for student use.

Written-test answers. This component is designed to assist the teacher in evaluating student performance on the written test.

Teacher supplements. Teacher supplements are optional materials for the teacher to use. They may provide the teacher with state-of-the-art information in which the teacher may not have background or with information that is not readily available in other books or with information they may need to help students complete the required assignments/lab activities in the student edition.

Unit evaluation form. This form provides teachers with a record of each student's performance on a unit of instruction. It includes space for assignment-sheet ratings, lab activity-sheet ratings, written-test scores, and teacher comments. The unit evaluation form is included in the teacher edition only, but duplication is permitted for student use.

Competency Profile

Name: _____

Directions: Evaluate the student using one of the optional rating scales below. Write the appropriate numbers/letters to indicate the degree of competency achieved. The descriptions associated with each of the numbers/letters focus on a level of student performance for each of the tasks listed. The written-test scoreline is provided for optional teacher use. It may not be applicable in all cases.

Optional rating scales

Option A

Rating scale:
- 4 — **Skilled** – Can perform job with no additional training.
- 3 — **Moderately skilled** – Has performed job during training program; limited additional training may be required.
- 2 — **Limited skill** – Has performed job during training program; additional training is required to develop skill.
- 1 — **Unskilled** – Is familiar with process, but is unable to perform job.
- 0 — **No exposure** – No information or practice provided during training program, complete training is required.
- NA — **Non-applicable**.

Option B

Yes — Can perform job with no additional training.
No — Is unable to perform satisfactorily.

Exploring Communication Technology

_____ 1. Research a communication career

_____ 2. Design and transmit a nonverbal message

_____ 3. Practice designing an interference-free verbal message

_____ 4. Design a visual message

_____ 5. Practice designing an interference-free coded message

_____ 6. Design an audiovisual message

_____ 7. Simulate satellite communication

_____ 8. Take a series of photographs

_____ 9. Simulate fiber-optic communication

_____10. Produce and transmit an audiovisual message

_____11. _____

_____Written-test score

Continue to back of page.

Competency Profile

Comments: _____

_____

_____

_____

_____

Evaluator: _____ Date: _____

Permission to duplicate this profile is granted.

Instructional/Task Analysis

Exploring Communication Technology

Related Information: What the student should know	Application: What the student should be able to do
1. Definitions of the terms *communication system* and *interference*	13. Research a communication career
2. Definitions of the stages in a basic communication system	14. Design and transmit a nonverbal message
3. Forms of interference that can occur at the various stages in a basic communication system	15. Practice designing an interference-free verbal message
4. The importance of feedback in a basic communication system	16. Design a visual message
5. The parts of the process in a basic communication system	17. Practice designing an interference-free coded message
6. The goals of communication	18. Design an audiovisual message
7. Definitions of the basic types of communication	19. Simulate satellite communication
8. The steps in designing a message to be communicated	20. Take a series of photographs
9. Methods used to plan the initial message design in visual, audio, and audiovisual messages	21. Simulate fiber-optic communication
10. Some methods used to produce and transmit visual messages	22. Produce and transmit an audiovisual message
11. Some methods used to produce and transmit audio and audiovisual messages	
12. Emerging communication-transmission technologies	

Academic and Workplace Skill Classifications and Definitions

Skill group	Subskill	Definition
Basic skills	Reading	Comprehending written information and analyzing, summarizing, and applying what has been read to a specific task.
	Writing	Communicating a thought, idea, or fact in written form in a clear, concise manner.
	Arithmetic/ mathematics	Performing basic computations, applying estimating and reasoning skills, and solving practical problems using a variety of mathematical techniques.
	Science	Applying knowledge learned through study and practice that is based on scientific principles, methods, and techniques.
	Listening	Receiving, interpreting, and responding to verbal messages and other cues.
	Speaking	Communicating a thought, idea, or fact verbally in a clear, concise manner.
Thinking skills	Creative thinking	Using imagination to generate new ideas.
	Decision making	Specifying goals and constraints, generating alternatives, considering risks, and evaluating and choosing the best alternative.
	Problem solving	Recognizing and defining problems, devising and implementing a plan of action, and tracking and evaluating results.
	Seeing things in the mind's eye	Mentally organizing and processing symbols, pictures, graphs, and other information.
	Knowing how to learn	Using efficient learning techniques to acquire and apply new knowledge and skills.
	Reasoning	Applying a rule or principle underlying the relationship between two or more objects when solving a problem.
Personal-management skills	Responsibility	Exerting a high level of effort towards goal attainment, working hard to become excellent at doing tasks by setting high standards, paying attention to details, and displaying a high level of concentration.
	Self-esteem	Developing self-confidence and maintaining a positive view of self.
	Career awareness, development, and mobility	Assessing self accurately, setting personal goals, establishing and implementing a plan, and monitoring progress.
	Integrity/honesty	Choosing an ethical course of action when faced with making a decision that may break with personal or societal values and recognizing the impact of violating these beliefs and codes on an organization, self, and others.
	Organizational effectiveness	Adapting to the organization's goals, values, culture, and traditional modes of operation.

Academic and Workplace Skill Classifications and Definitions

Skill group	Subskill	Definition
Resources	Time	Selecting relevant, goal-related activities; ranking them in order of importance; allocating time; and understanding, preparing, and following schedules.
	Money	Using or preparing budgets, making forecasts, keeping records, and making adjustments to meet objectives.
	Material and facilities	Acquiring, storing, and using materials and space efficiently.
	Human resources	Assessing skills and distributing work accordingly; evaluating performance and providing feedback.
Interpersonal skills	Teamwork	Working cooperatively with others to reach a common goal.
	Coaching	Helping others learn new skills.
	Leadership	Communicating ideas to justify position; accepting responsibility for others; and encouraging, persuading, convincing, or otherwise motivating an individual or group.
	Negotiation	Resolving conflict between two or more individuals through discussion and compromise.
	Customer service	Working and communicating with customers to satisfy their expectations.
	Cultural diversity	Working well with men and women with a variety of ethnic, social, or educational backgrounds.
Information	Acquisition and evaluation	Identifying need for data, obtaining it from existing sources or creating it, and evaluating its relevance and accuracy.
	Organization and storage	Organizing, processing, and maintaining written or computerized records and other forms of information in a systematic way.
	Interpretation	Selecting and analyzing information and communicating the results to others.
	Processing	Using computers to acquire, organize, analyze, and communicate information.
Systems	Interrelationships	Knowing how social, organizational, and technological systems work and operate effectively.
	Monitoring	Distinguishing trends, predicting impact of actions on system operations, diagnosing deviations in systems' performance, and correcting malfunctions.
	Modification and design	Making suggestions to modify existing systems to improve products or services, and developing new or alternative systems.
Technology	Selection	Choosing procedures, tools, or equipment including computers and related technologies.
	Application	Demonstrating proper procedures for setting up and operating equipment.
	Maintenance and troubleshooting	Preventing, identifying, or solving problems with equipment, including computers and other technologies.

Related Academic and Workplace Skills List

Exploring Communication Technology

Task	Skill group	Subskill	Definition
Research a communication career (A.S. 1)	Basic skills	Reading	Comprehending written information and analyzing, summarizing, and applying what has been read to a specific task
		Writing	Communicating a thought, idea, or fact in written form in a clear, concise manner
	Thinking skills	Knowing how to learn	Using efficient learning techniques to acquire and apply new knowledge and skills
	Personal-management skills	Career awareness, development, and mobility	Assessing self accurately, setting personal goals, establishing and implementing a plan, and monitoring progress
	Information	Acquisition and evaluation	Identifying need for data, obtaining it from existing sources or creating it, and evaluating its relevance and accuracy
		Interpretation	Selecting and analyzing information and communicating the results to others
Design and transmit a nonverbal message (A.S. 2)	Basic skills	Reading	Comprehending written information and analyzing, summarizing, and applying what has been read to a specific task
		Writing	Communicating a thought, idea, or fact in written form in a clear, concise manner
	Thinking skills	Creative thinking	Using imagination to generate new ideas
		Seeing things in the mind's eye	Mentally organizing and processing symbols, pictures, graphs, and other information
	Information	Interpretation	Selecting and analyzing information and communicating the results to others
Practice designing an interference-free verbal message (A.S. 3)	Basic skills	Reading	Comprehending written information and analyzing, summarizing, and applying what has been read to a specific task
		Writing	Communicating a thought, idea, or fact in written form in a clear, concise manner
	Thinking skills	Problem solving	Recognizing and defining problems, devising and implementing a plan of action, and tracking and evaluating results
		Seeing things in the mind's eye	Mentally organizing and processing symbols, pictures, graphs, and other information
Design a visual message (A.S. 4)	Basic skills	Reading	Comprehending written information and analyzing, summarizing, and applying what has been read to a specific task
		Writing	Communicating a thought, idea, or fact in written form in a clear, concise manner

Related Academic and Workplace Skills List

Task	Skill group	Subskill	Definition
A. S. 4 (cont.)	Thinking skills	Creative thinking	Using imagination to generate new ideas
		Decision making	Specifying goals and constraints, generating alternatives, considering risks, and evaluating and choosing the best alternative
		Seeing things in the mind's eye	Mentally organizing and processing symbols, pictures, graphs, and other information
	Information	Interpretation	Selecting and analyzing information and communicating the results to others
Practice designing an interference-free coded message (A.S. 5)	Basic skills	Reading	Comprehending written information and analyzing, summarizing, and applying what has been read to a specific task
		Writing	Communicating a thought, idea, or fact in written form in a clear, concise manner
	Thinking skills	Creative thinking	Using imagination to generate new ideas
		Decision making	Specifying goals and constraints, generating alternatives, considering risks, and evaluating and choosing the best alternative
		Seeing things in the mind's eye	Mentally organizing and processing symbols, pictures, graphs, and other information
	Information	Interpretation	Selecting and analyzing information and communicating the results to others
Design an audiovisual message (A.S. 6)	Basic skills	Reading	Comprehending written information and analyzing, summarizing, and applying what has been read to a specific task
		Writing	Communicating a thought, idea, or fact in written form in a clear, concise manner
	Thinking skills	Creative thinking	Using imagination to generate new ideas
		Decision making	Specifying goals and constraints, generating alternatives, considering risks, and evaluating and choosing the best alternative
		Seeing things in the mind's eye	Mentally organizing and processing symbols, pictures, graphs, and other information
	Resources	Human resources	Assessing skills and distributing work accordingly; evaluating performance and providing feedback
	Interpersonal skills	Teamwork	Working cooperatively with others to reach a common goal
	Information	Interpretation	Selecting and analyzing information and communicating the results to others

Related Academic and Workplace Skills List

Task	Skill group	Subskill	Definition
Simulate satellite communication (L.A.S. 1)	Basic skills	Reading	Comprehending written information and analyzing, summarizing, and applying what has been read to a specific task
		Writing	Communicating a thought, idea, or fact in written form in a clear, concise manner
		Listening	Receiving, interpreting, and responding to verbal messages and other cues
		Science	Applying knowledge learned through study and practice that is based on scientific principles, methods, and techniques
	Thinking skills	Problem solving	Recognizing and defining problems, devising and implementing a plan of action, and tracking and evaluating results
	Resources	Material and facilities	Acquiring, storing, and using materials and space efficiently
	Interpersonal skills	Teamwork	Working cooperatively with others to reach a common goal
	Information	Interpretation	Selecting and analyzing information and communicating the results to others
	Technology	Selection	Choosing procedures, tools, or equipment including computers and related technologies
		Application	Demonstrating proper procedures for setting up and operating equipment
		Maintenance and troubleshooting	Preventing, identifying, or solving problems with equipment, including computers and other technologies
Take a series of photographs (L.A.S. 2)	Basic skills	Reading	Comprehending written information and analyzing, summarizing, and applying what has been read to a specific task
		Writing	Communicating a thought, idea, or fact in written form in a clear, concise manner
		Science	Applying knowledge learned through study and practice that is based on scientific principles, methods, and techniques
	Thinking skills	Problem solving	Recognizing and defining problems, devising and implementing a plan of action, and tracking and evaluating results
	Resources	Material and facilities	Acquiring, storing, and using materials and space efficiently
	Information	Interpretation	Selecting and analyzing information and communicating the results to others
	Technology	Selection	Choosing procedures, tools, or equipment including computers and related technologies

Related Academic and Workplace Skills List

Task	Skill group	Subskill	Definition
L.A.S. 2 (cont.)		Application	Demonstrating proper procedures for setting up and operating equipment
		Maintenance and troubleshooting	Preventing, identifying, or solving problems with equipment, including computers and other technologies
Simulate fiber-optic communication (L.A.S. 3)	Basic skills	Reading	Comprehending written information and analyzing, summarizing, and applying what has been read to a specific task
		Writing	Communicating a thought, idea, or fact in written form in a clear, concise manner
		Listening	Receiving, interpreting, and responding to verbal messages and other cues
		Science	Applying knowledge learned through study and practice that is based on scientific principles, methods, and techniques
	Thinking skills	Problem solving	Recognizing and defining problems, devising and implementing a plan of action, and tracking and evaluating results
	Resources	Material and facilities	Acquiring, storing, and using materials and space efficiently
	Interpersonal skills	Teamwork	Working cooperatively with others to reach a common goal
	Information	Interpretation	Selecting and analyzing information and communicating the results to others
	Technology	Selection	Choosing procedures, tools, or equipment including computers and related technologies
		Application	Demonstrating proper procedures for setting up and operating equipment
		Maintenance and troubleshooting	Preventing, identifying, or solving problems with equipment, including computers and other technologies
Produce and transmit an audiovisual message (L.A.S. 4)	Basic skills	Reading	Comprehending written information and analyzing, summarizing, and applying what has been read to a specific task
		Writing	Communicating a thought, idea, or fact in written form in a clear, concise manner
		Listening	Receiving, interpreting, and responding to verbal messages and other cues
		Science	Applying knowledge learned through study and practice that is based on scientific principles, methods, and techniques
	Thinking skills	Problem solving	Recognizing and defining problems, devising and implementing a plan of action, and tracking and evaluating results

Related Academic and Workplace Skills List

Task	Skill group	Subskill	Definition
L.A.S. 4 (cont.)	Resources	Material and facilities	Acquiring, storing, and using materials and space efficiently
	Interpersonal skills	Teamwork	Working cooperatively with others to reach a common goal
	Information	Interpretation	Selecting and analyzing information and communicating the results to others
	Technology	Selection	Choosing procedures, tools, or equipment including computers and related technologies
		Application	Demonstrating proper procedures for setting up and operating equipment
		Maintenance and troubleshooting	Preventing, identifying, or solving problems with equipment, including computers and other technologies

Exploring Communication Technology

Suggested Activities

Instructional plan

Preparation

Plan your presentation.

- Review the student components presented for this unit in the student edition.
  - — Objective Sheet
  - — Information Sheet
  - — Assignment Sheet 1, "Research a Communication Career"
  - — Student Supplement 1, "Examples of Some of the Careers in the Communication Area"
  - — Assignment Sheet 2, "Design and Transmit a Nonverbal Message"
  - — Student Supplement 2, "Body Language—A Form of Nonverbal Communication"
  - — Assignment Sheet 3, "Practice Designing an Interference-Free Verbal Message"
  - — Student Supplement 3, "Final Draft of the Step-by-Step Duplication Instructions"
  - — Assignment Sheet 4, "Design a Visual Message"
  - — Student Supplement 4, "Elements of Visual Design"
  - — Assignment Sheet 5, "Practice Designing an Interference-Free Coded Message"
  - — Student Supplement 5, "Final Drafts of Your Description, Code Key, and Coded Message"
  - — Assignment Sheet 6, "Design an Audiovisual Message"
  - — Student Supplement 6, "The Basics of Audiovisual Planning and Production"
  - — Lab Activity Sheet 1, "Simulate Satellite Communication"
  - — Lab Activity Sheet 2, "Take a Series of Photographs"
  - — Lab Activity Sheet 3, "Simulate Fiber-Optic Communication"
  - — Lab Activity Sheet 4, "Produce and Transmit an Audiovisual Message"
- Review the teacher components presented for this unit in this teacher edition.
  - — Learning Activities Sheet
  - — Teacher Supplement 1, "Using the AIT Media Programs"
  - — Optional Assignment Sheet 1, "AIT Media Questions for Discussion and Review"
  - — Teacher Supplement 2, "Houston, We've Got a Problem"
  - — Teacher Supplement 3, "Illustrations to Be Used in Assignment Sheet 3"
  - — Teacher Supplement 4, "Laser Classifications and Power Ratings"
  - — Teacher Supplement 5, "Laser Caution Sign"
  - — Optional Assignment Sheet 2, "Sketch an Object"
  - — Optional Student Supplement 1, "The Basics of Making Engineering/Drafting Sketches"
  - — Optional Assignment Sheet 3, "Use a CAD System to Complete a Multiview Drawing"

Suggested Activities

— Optional Student Supplement 2, "CAD Basics"
— Optional Assignment Sheet 4, "Design a Web Page"
— Optional Student Supplement 3, "Web Basics"
— Answers to Assignment Sheets
— Written Test
— Answers to Written Test
— Unit Evaluation Form

The **Learning Activities Sheet** is a step-by-step instruction sheet you may copy and distribute to your students to guide their individual study through the required components in the student edition (Objective Sheet, Information Sheet, Assignment Sheets, Student Supplements, Lab Activity Sheets).

Note that Step 3 on this Learning Activities Sheet asks the student to watch unnamed media presentations and complete the questions for discussion and review. You may obtain and show the AIT media presentations designed to go with this unit. **Teacher Supplement 1, "Using the AIT Media Programs,"** summarizes the content of these presentations (see the Suggested Supplemental Materials section below for ordering information).

If you select the AIT media presentations, write the names of those media presentations on the blank lines in the Learning Activities Sheet, or if you have selected other media presentations to use with your class, write in the title of those presentations.

If you use the AIT media presentations, you may use **Optional Assignment Sheet 1** in Step 3, which asks students to complete questions for discussion and review. If you use other media presentations, you should prepare your own questionnaire to be used with Step 3 on the Learning Activities Sheet and title it "Questions for Discussion and Review."

Teacher Supplement 2, "Houston, We've Got a Problem," presents the story behind the Apollo 13 flight, which is used as an example of the importance of the feedback loop in the communication process in the AIT media presentation "Evaluating Messages." You may want to copy this supplement to hand out to your students, or you may use it for background information to use in a class discussion.

Teacher Supplement 3, "Illustrations to Be Used in Assignment Sheet 3," are examples of drawings you will insert into Assignment Sheet 3 in the student edition, "Practice Designing an Interference-Free Verbal Message." Students will use these illustrations in writing a step-by-step procedure for duplicating an illustration.

Teacher Supplement 4, "Laser Classifications and Power Ratings," and **Teacher Supplement 5, "Laser Caution Sign,"** are teacher-directed materials explaining the type of laser to be used in Lab Activity Sheet 1 in the student edition, "Simulate Satellite Communication."

Optional Assignment Sheet 2, "Sketch an Object"; Optional Student Supplement 1, "The Basics of Making Engineering/Drafting Sketches"; Optional Assignment Sheet 3, "Use a CAD System to Complete a Multiview Drawing"; and **Optional Student Supplement 2, "CAD Basics,"** can be used as an optional series of communication assignments and information on making basic engineering/drafting sketches and drawings. This series of assignments is made optional since the series guides students to using a CAD system, which may not be available in every technology education classroom.

Optional Assignment Sheet 4, "Design a Web Page," and **Optional Student Supplement 3, "Web Basics,"** can be used as an optional communication assignment and information on creating an Internet Web site for your technology classes. The assignment calls for a student to design one page of the site. This, therefore, becomes a class project where students must work together as a group to design and coordinate the design of the various pages that will become the complete Web site. This, too, was made an optional assignment since every technology education class may not have the software and hardware necessary to complete the class project outlined.

- Modify the Learning Activities Sheet as needed to reflect your instructional plan. Copy and prepare the Learning Activity Sheet for distribution to your students.
- Copy and prepare the teacher components you select to distribute to your students. (Written Test, Unit Evaluation Form)
- Prepare the classroom by putting up posters and charts and displaying articles and other references related to the objectives of this unit.

Delivery and application

Have students complete the steps in the Learning Activities Sheet, "Exploring Communication Technology."

Evaluation

- Evaluate the assignment sheets. See the evaluation criteria listed at the top of each assignment sheet as well as the teacher page **Answers to Assignment Sheets**.
- Evaluate the lab activity sheets. See the evaluation criteria listed on the worksheet that accompanies each lab activity sheet.
- Give the written test. See the teacher page **Written Test**.
- Evaluate the written test. See the teacher page **Answers to Written Test**.
- Compile written-test, assignment-sheet, and lab-activity-sheet scores. See the teacher page **Unit Evaluation Form**.
- Reteach and retest as required.

Suggested Activities

Suggested resources

Resources used in developing this unit

Print media

- Buck, Sue, Kevin Allen, and Eric Davis. *Exploring Aeronautics and Space Technology.* Stillwater, Oklahoma: Mid-America Vocational Curriculum Consortium, Inc., 1991.

- Murray, Steve. *Exploring Technology Education,* 2nd ed. Stillwater, Oklahoma: Mid-America Vocational Curriculum Consortium, Inc., 1991.

Suggested supplemental resources

- AIT media programs, copyright 1990:

  Introduction to Communication

  Designing Messages

  Producing and Transmitting Messages

  Evaluating Messages

  Available from:

  Agency for Instructional Technology (AIT)
  Box A
  Bloomington, Indiana 47402

  Phone: (800) 457-4509 or (812) 339-2203

Exploring Communication Technology

Learning Activities Sheet

Put a checkmark in each blank as you complete each of the steps below.

_____	1.	**Read**	Objective Sheet.
_____	2.	**Study**	Information Sheet.
_____	3.	**Watch**	Media presentations _____
			_____
		and	
		Complete	"Questions for Discussion and Review."
_____	4.	**Read**	Student Supplement 1, "Examples of Some of the Careers in the Communication Area."
_____	5.	**Do**	Assignment Sheet 1, "Research a Communication Career."
_____	6.	**Stop**	Have your instructor evaluate the completed assignment sheet. If the evaluation is satisfactory, continue to Step 7. If the evaluation is not satisfactory, repeat Steps 4 and 5.
_____	7.	**Read**	Student Supplement 2, "Body Language—A Form of Nonverbal Communication."
_____	8.	**Do**	Assignment Sheet 2, "Design and Transmit a Nonverbal Message."
_____	9.	**Stop**	Have your instructor evaluate the completed assignment sheet. If the evaluation is satisfactory, continue to Step 10. If the evaluation is not satisfactory, repeat Steps 7 and 8.
_____	10.	**Review**	Student Supplement 3.
_____	11.	**Do**	Assignment Sheet 3, "Practice Designing an Interference-Free Verbal Message."
_____	12.	**Stop**	Have your instructor evaluate the completed assignment sheet. If the evaluation is satisfactory, continue to Step 13. If the evaluation is not satisfactory, repeat Steps 10 and 11.
_____	13.	**Do**	Lab Activity Sheet 1, "Simulate Satellite Communication."
_____	14.	**Stop**	Have your instructor evaluate the completed lab activity. If the evaluation is satisfactory, continue to Step 15. If the evaluation is not satisfactory, repeat Step 13.

Continue to next page.

_____ 15.	**Read**	Student Supplement 4, "Elements of Visual Design."
_____ 16.	**Do**	Assignment Sheet 4, "Design a Visual Message."
_____ 17.	**Stop**	Have your instructor evaluate the completed assignment sheet. If the evaluation is satisfactory, continue to Step 18. If the evaluation is not satisfactory, repeat Steps 15 and 16.
_____ 18.	**Do**	Lab Activity Sheet 2, "Take a Series of Photographs."
_____ 19.	**Stop**	Have your instructor evaluate the completed lab activity. If the evaluation is satisfactory, continue to Step 20. If the evaluation is not satisfactory, repeat Step 18.
_____ 20.	**Review**	Student Supplement 5.
_____ 21.	**Do**	Assignment Sheet 5, "Practice Designing an Interference-Free Coded Message."
_____ 22.	**Stop**	Have your instructor evaluate the completed assignment sheet. If the evaluation is satisfactory, continue to Step 23. If the evaluation is not satisfactory, repeat Steps 20 and 21.
_____ 23.	**Do**	Lab Activity Sheet 3, "Simulate Fiber-Optic Communication."
_____ 24.	**Stop**	Have your instructor evaluate the completed lab activity. If the evaluation is satisfactory, continue to Step 25. If the evaluation is not satisfactory, repeat Step 23.
_____ 25.	**Read**	Student Supplement 6, "The Basics of Audiovisual Planning and Production."
_____ 26.	**Do**	Assignment Sheet 6, "Design an Audiovisual Message."
_____ 27.	**Stop**	Have your instructor evaluate the completed assignment sheet. If the evaluation is satisfactory, continue to Step 28. If the evaluation is not satisfactory, repeat Steps 25 and 26.
_____ 28.	**Do**	Lab Activity Sheet 4, "Produce and Transmit an Audiovisual Message."
_____ 29.	**Stop**	Have your instructor evaluate the completed lab activity. If the evaluation is satisfactory, continue to Step 30. If the evaluation is not satisfactory, repeat Step 28.
_____ 30.	**Stop**	Check with your instructor for any optional activities he or she may choose to assign.

Continue to next page.

Learning Activities Sheet

_____ 31. **Do** Optional activities listed below.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ 32. **Stop** Have your instructor evaluate the optional activities. If the evaluation is satisfactory, continue to Step 33. If the evaluation is not satisfactory, repeat Step 31 as your instructor directs.

_____ 33. **Take** Written Test.

_____ 34. **Stop** Have your instructor evaluate the completed written test. If the evaluation is satisfactory, proceed to the next learning activities sheet. If your evaluation is not satisfactory, ask your instructor for directions for reviewing the information in this unit.

Permission to duplicate this form is granted.

Teacher Supplement 1—Using the AIT Media Programs

Note

A series of four AIT media programs were designed to supplement this unit, "Exploring Communication Technology." The first program in the series is "Introduction to Communication"; the second program is "Designing Messages"; the third program is "Producing and Transmitting Messages"; the fourth program is "Evaluating Messages." Summaries and objectives for each of these four programs are given below.

Program name

AIT media, "Introduction to Communication"

Program summary

This program introduces communication technology—its system components, devices, technological advances, and relationship to other technology systems. It focuses on the impact of communication technology throughout history, as people seek to communicate further and faster to conquer space and time.

Defining communication as the process of sending and receiving a message, the program opens with images of Buster Keaton trying to talk to a horse, a teenager with a Walkman, and astronauts walking on the moon. The narrator explains that communication can link us all together. A blind and deaf woman communicates with a companion, using an electronic braillewriter. All communication is founded on a systems model: sender, message, receiver, and a feedback loop.

The program then rapidly reviews technological progress in communication through history. Images and humorous sequences show how primitive cave drawings, hieroglyphics, clay tablets, and hand-copied manuscripts gave way to printing when Gutenberg started using movable type. The transmission of messages across distances improved rapidly in the last 150 years, with the development of the Morse telegraph, the transatlantic cable, the Bell telephone, the Marconi wireless telegraph, the phonograph, radio, and television. Satellite transmission, mobile phones, and the computer, using modems and electronic bulletin boards, further enhance the earlier technologies. The narrator reviews the systems model that shapes even the most advanced of these technologies, and mentions other communication devices, such as radio-controlled explosives, computer-assisted drafting, air-traffic control, and computer-enhanced aerial photography. The program concludes with a look at communication technologies of the future—now being developed at MIT's Media Lab—and the Voyager space probe.

Program objectives

The media program is designed to illustrate that

- communication follows a systems model: sender, message, receiver, and feedback loop.
- advances in the construction; manufacturing; and energy, power, and transportation sectors influence advances in communication systems.

Teacher Supplement 1

Program name

AIT media, "Designing Messages"

Program summary

This program is about designing an effective visual message. It presents the three steps for designing a message and demonstrates the elements of good design.

The narrator points out that a newspaper is a message, and must be carefully thought out. To design a newspaper, or any visual message, planners must consider *audience*—who the audience is and what the audience wants; *content*—is the content appropriate for the targeted audience; and *form*, which involves such design elements as line, color, readability, balance, space, and unity.

The program visits the headquarters of *USA Today* to demonstrate how feedback from readers influences decisions of content and form. An editor, a meteorologist, and two graphic designers discuss how they transform information into effective visual images. The narrator looks briefly at other publications and television programs to show how the same design considerations determine different formats for different audiences. The program concludes by looking to the future, when an artificial intelligence system might make it possible for each of us to customize our own magazine for our own personal use.

Program objectives

The media program is designed to illustrate that

- design considerations for any message include *audience*—who the message is for; *content*—what the message is; and *form*—how the message is to be presented.
- important design elements in the form of a visual message are line, color, readability, space, balance, and unity.

Program name

AIT media, "Producing and Transmitting Messages"

Program summary

This program is about producing messages for print and television, and what technology is used to create and transmit those messages.

A visit to *USA Today* demonstrates the central role of computers, which permit reporters to call up information from wire services and data banks, write their stories, send them to an editor, and then, transmit final copy to a typesetting machine. Computers do half the layout; with the help of a laser scan, pictures are color-separated and reassembled for printing. A facsimile scanner (FAX machine) "reads" the page and changes it to digital signals for transmission via satellite to 32 printing plants. In these printing plants, the process is reversed to print identical newspapers simultaneously across the country.

The narrator reviews the communication model, using the Live Aid concert as an example. Simultaneous transmission by 14 satellites produced feedback in the form of money pouring in from all over the world. Then, the video shows how a title sequence is created with the help of computerized "paint" programs and storyboards. A glance at the future introduces the potential of fiber optics.

Program objectives

The media program is designed to illustrate that

- messages are produced for print and television through a variety of methods, using drawing, video, and other production processes.
- messages are transmitted by telephone, television, computer modem, satellite, and other means.
- emerging transmission technologies—lasers, fiber optics, and satellites—enable a message to be transmitted simultaneously throughout the world.

Program name

AIT media, "Evaluating Messages"

Program summary

This media program focuses on the importance of feedback in the communication process and how technology has improved the transmission of this feedback. It opens with an image of the SETI antenna, a radio transmitter to outer space, and moves to a scene in which a teenager tries to order a hamburger at a drive-in restaurant with an unintelligible intercom. There is a lack of clear or adequate feedback in each case. *USA Today* and the Live Aid concert have been successful at receiving feedback, but the pilot whose plane hit the Empire State Building raised no response to his calls for help. When the Apollo 13 flight was in danger, feedback from Mission Control provided the astronauts with the help they needed to land safely. (See Teacher Supplement 2, "Houston, We've Got a Problem.")

Technology brings about ever-faster communication and feedback. The movement of mail reflects major technological improvements in transportation, manufacturing, and energy. Now, express-mail centers can process huge volumes of mail so that they will arrive the day after they have been sent. Boy Scouts using computers with modems can transmit articles for their newsletter instantaneously. A disc jockey on a rock radio program describes how important it is to find ways of getting feedback from his invisible audience. Rating services supply feedback for radio and television broadcasters. The program ends with a request from the producers of the *Exploring Technology Education* media programs for viewers to send in feedback about the media programs. (Send feedback to AIT, Box A, Bloomington, Indiana 47402.)

Teacher Supplement 1

Program objectives

The media program is designed to illustrate that

- in communication, feedback is necessary to determine whether a message is received.
- there are many different methods and devices used for obtaining feedback in all areas of communication technology.
- technology provides greater quantities of feedback more quickly and accurately than ever before.

Optional Assignment Sheet 1—AIT Media Questions for Discussion and Review

Name _____ Date _____

Evaluation criteria	Rating
Directions have been followed.	_____
Student responses are relevant and well thought out.	_____
Overall rating	_____

Evaluator's comments _____

_____

_____

Exercise

Directions As you watch the following AIT media presentations, answer the following questions in the space provided below each question.

Part A **AIT media, "Introduction to Communication"**

Discussion/ review questions

1. What is *communication*?

2. What are the main purposes of communication?

3. List some of the ways people communicate.

4. What are examples of
   - person-to-person communication devices?

Optional Assignment Sheet 1

- person-to-machine communication devices?

- a machine-to-machine communication device?

5. What are the terms associated with the communication systems model?

6. Describe the telephone in terms of the universal systems model (input, process, output, feedback).

7. Describe the microcomputer in terms of the universal systems model (input, process, output, feedback).

8. How has technology affected the way we communicate?

9. How have advances in other technology systems affected communication technology?

Optional Assignment Sheet 1

Part B **AIT media, "Designing Messages"**

1. What are the general considerations for the design of any message?

2. How has technology affected the way we design messages?

3. What are the important design elements in a visual message?

Part C **AIT media, "Producing and Transmitting Messages"**

1. What are the terms of the communication systems model?

2. What examples in the media program illustrate the communication model?

3. Describe methods used to produce messages that were shown in the media program.

4. What methods for transmitting messages were shown in the media presentation?

5. The *USA Today* newspaper was transmitted by satellite to 32 different printing plants. What other "messages" can be transmitted via satellite?

Optional Assignment Sheet 1

6. What communication technology was necessary for the production and transmission of the Live Aid concert? How did the other technological systems—manufacturing, construction, transportation—contribute to the communication of the Live Aid message?

7. Think of a variety of ways to transmit messages, and then, answer the following questions.

   - What message does an architect transmit to a building contractor so that the contractor constructs a house according to the ideas of the architect?

   - How do politicians seeking government office transmit their ideas?

   - How do you transmit messages?

8. How will messages be produced and transmitted in the future, and how might they change the way we live?

Optional Assignment Sheet 1

Part D **AIT media, "Evaluating Messages"**

1. What is feedback, and why is it necessary to have feedback in communication technology?

2. Give an example of feedback, describing methods used to provide feedback and evaluate messages that were shown in the media presentation.

3. How have feedback and evaluation been improved in recent years? What has been the effect in changing the way people have lived throughout history?

4. How can feedback be improved in the future? What effect will it have on the way we will live?

Permission to duplicate this assignment is granted.

Teacher Supplement 2—Houston, We've Got a Problem

Introduction

Without precise and efficient communication between the crew and Mission Control, the three astronauts aboard Apollo 13 would not have survived the return trip.

As Captain James Lovell, commander of the ill-starred Apollo 13 mission, described it: "Fred (Haise, the lunar module pilot) was still in the lunar module. Jack (Swigert, pilot of the command module) was back in the command module in the left-hand seat and I was halfway in between the lower equipment bay wrestling with TV wires and a camera—watching Fred come on down—when all three of us heard a rather large bang—just one bang. Now, before that . . . Fred had actuated a valve that normally gives us that same sound. Since he didn't tell us about it, we all rather jumped up and were sort of worried about it; but it was his joke and we all thought it was a lot of fun at the time. So when this bang came, we really didn't get concerned right away . . . but then I looked up at Fred . . . and Fred had that expression like it wasn't his fault. We suddenly realized that something else had occurred . . . but exactly what we didn't know."

Haise said he felt a vibration. Up in the command module, Swigert reported, ". . . about 2 seconds elapsed when I had a master alarm and a main bus 'B' undervolt (i.e., a loss of power) . . . I transmitted to Houston that we had a problem."

Lovell continued: ". . . My concern was increasing all the time. It went from 'I wonder what this is going to do to the landing' to 'I wonder if we can get back home again' . . . and when I looked up and saw both oxygen pressures . . . one actually at zero and the other one going down . . . it dawned on me that we were in serious trouble."

Lovell's assessment was accurate and, if anything, conservative. The bang he heard was the explosion of the second liquid oxygen tank in the service module (SM). This tank provided the vital oxygen on which fuel cells 1 and 2 relied to generate the electric power to operate the systems in the command and service module (CSM). The fuel cells were Apollo's primary power source. There was a backup battery-powered electric supply in the CSM with a lifetime of as much as 10 hours. Under ideal circumstances, Apollo 13, at the time of the explosion, was 87 hours from home.

Emergency in space

The nature and dimensions of the emergency were starkly evident to the crew and to the Mission Control Center. Lovell and his crewmates were more than 200,000 nautical miles out in space with a dead SM, including its main propulsion engine. The explosion had destroyed the CSM's main supply of life-sustaining oxygen and power. The command module's (CM's) operating life of 10 hours had to be reserved for the approach to the Earth's atmosphere because, of the three modules, the CM alone had the heat shield that would allow the crew to re-enter the atmosphere and splash down safely.

The crew's salvation rested with the lunar module (LM). This oddly shaped spacecraft was designed to drop out of lunar orbit after separating from the CSM, land two astronauts gently on the Moon and sustain them while there, and then carry them back to a rendezvous with the mother ship in lunar orbit. However, with the CSM a partial wreck and drifting in space, the LM became the lifeboat. Mission Control aborted the mission and ordered the crew into the LM.

What followed was an epic struggle that pitted the skilled and highly trained professionals in the spacecraft working in close coordination with the ground-based team at the Mission Control Center against the hostile environment of space. For 86 hours and 57 minutes—more than three tension-packed days—the struggle continued.

Mobilizing for the emergency

While the astronauts powered up the LM lifeboat, the Mission Control Center began mobilizing the substantial and varied talents available to help in dealing with the crisis. In addition to the contractor's representatives normally posted in Houston to assist with the flight, Mission Control phoned the manufacturers of the major systems and subsystems in the LM and in the CSM and instructed them to have their top specialists immediately available to help provide hard answers to even harder questions. Thus, the engineers and their simulators and computers at North American Rockwell (Rockwell International) were brought on-line. Experts at Grumman Aerospace Corporation (the LM manufacturer) were alerted as were the experts at TRW Systems who built the descent propulsion engine that would have to supply the thrust to put the spacecraft on the correct return course. A coast-to-coast network of simulators, computers, and experts was quickly hooked up. Their operation provided a tour de force of the breadth and depth of American technological competence.

The problem had two major aspects. One aspect was getting Odyssey and Aquarius, call names for the CM and the LM, respectively, on a true and quick course for home with the decisive factors being propulsion and guidance. The second aspect centered on the consumables—power, oxygen, and water—with the key being conservation.

More problems

The accident and the economies it forced on flight operations created a sequence of problems that kept Mission Control, its teams of experts, and the simulators and computers busy for most of the return trip. The three-module configuration made it necessary to recalculate course corrections and work out new detailed time lines. Maneuvers had to be refigured so that they could be executed with a minimum use of power and water (for cooling equipment). How would the linked LM and CM respond after the SM had been jettisoned? What would be the effect of discarding the LM 1 hour before reentry?

Questions of this kind, and there were many of them, were put through the various simulator and computer complexes until the ground team was certain that all possibilities had been checked out and that the best answers were in hand. Astronauts Alan Shepard and Ed Mitchell were operating one of the LM simulators at the Johnson Space Center in Houston and Astronauts Gene Cernan and David Scott were working in the other LM. At

Kennedy, Astronaut Dick Gordon was simulating emergency procedures in a third LM. It is estimated that these simulators were used about 40 hours each during the flight. One team of simulator specialists worked around the clock without a break. No procedure, maneuver instruction, or checklist was relayed to the crew that had not been thoroughly proven.

Ingenuity at work

Some difficulties that arose on the return trip were solved by means of jerryrigs that were marvels of ingenuity. The atmosphere in the spacecraft cabin is "washed" of carbon dioxide (produced by the crew's exhalations) by canisters of lithium hydroxide. The overload on the LM's canister system saturated it and the carbon dioxide in the cabin atmosphere began a potentially dangerous rise.

After studying the problem, Mission Control gave instructions to Lovell on how he could make an adapter that would allow the attachment of a hose to the lithium hydroxide canisters in the CM so that they could be used to purify the air. Lovell improved on the instructions by splicing together two hoses so that the rig would reach through the docking tunnel into the CM. Within an hour, carbon dioxide levels dropped sharply.

The amended reentry procedure called for two course corrections: the first to get the spacecraft more toward the center of the reentry corridor and the second to refine the angle of entry, which had to be between 5.5 and 7.5 degrees. Without the guidance platform powered up, the normal method of determining the attitude of the spacecraft would be by taking star sights. However, since the explosion in the SM, the spacecraft had been shrouded in a cloud of debris that glittered in the sun and made sighting on a star impossible. The Apollo 8 crew had worked out a technique of using the Earth's terminator and the sun. Lovell recounted his reaction at a postflight press conference:

"When the ground read out the procedure to us, I just couldn't believe it. I thought I'd never have to use something as way out as this. And here I was on Apollo 13, using this very same procedure . . . Because it was a manual burn, we had a three-man operation. Jack would take care of the time. He'd tell us when to light off the engine and when to stop it. Fred handled the pitch maneuver and I handled the roll maneuver and pushed the buttons to start and stop the engine." The burn made the desired refinement in the reentry angle of 6.49 degrees.

A successful failure

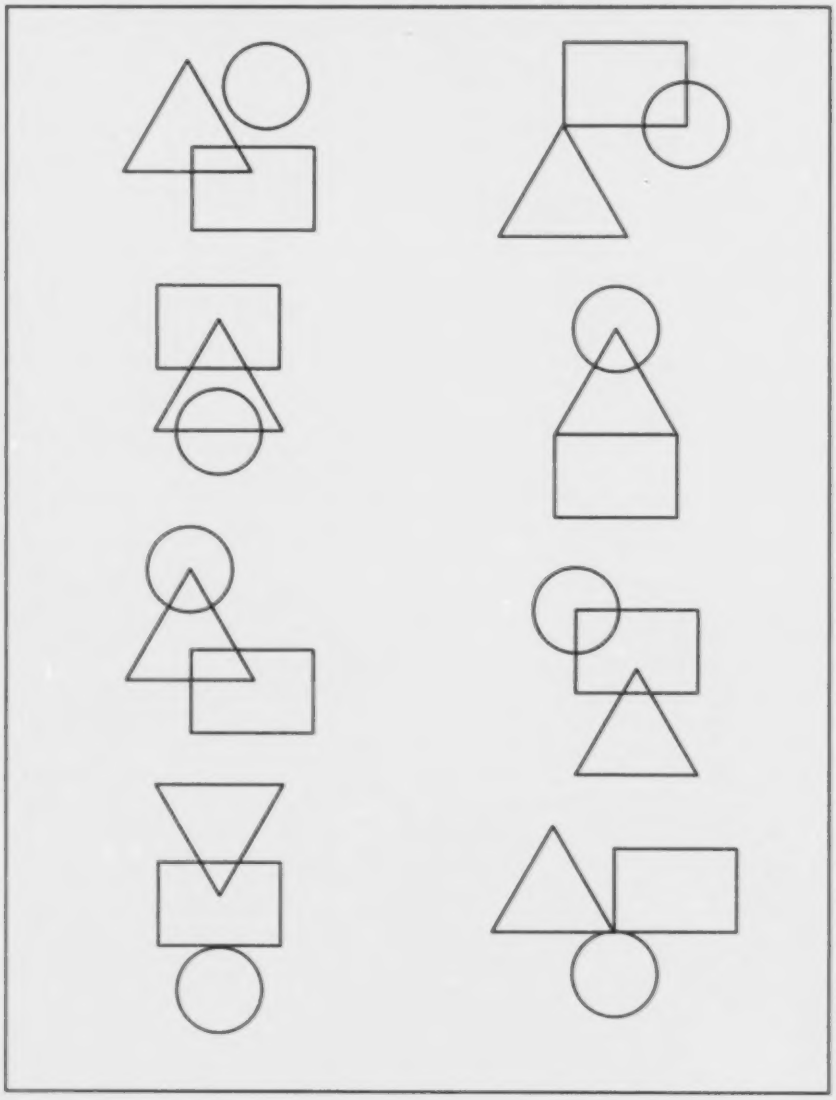
By a matchless display of tenacity, resourcefulness, ingenuity, and courage, the determined professionals at Mission Control working in close coordination with a coolly expert crew had averted catastrophe and brought the astronauts through a brush with death.

As an aborted mission, Apollo 13 must officially be classed as a failure, the first in 22 manned flights. But, in another sense, as a brilliant demonstration of the human capability under almost unbearable stress, it has to be the most successful failure in the annals of space flight.

Summarized from *NASA Facts*, "Apollo 13: A Successful Failure." National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, n.d.

Teacher Supplement 3—Illustrations to Be Used in Assignment Sheet 3

Directions The instructor will insert one of the following illustrations in the student edition where indicated in Assignment Sheet 3. The students will use these illustrations in writing step-by-step instructions for duplicating an illustration. If you need more than the eight illustrations shown here, you will find it easy to create similar drawings to be used with the assignment sheet.



Teacher Supplement 4—Laser Classifications and Power Ratings

General laser information

Lasers are classified into four major categories: Class I, Class II, Class III, and Class IV. Laser classifications are based on the output power of a laser's beam. The power of the laser beam is measured in milliwatts (mW).

Class I lasers are those that generate such a low-powered beam that they cannot cause damage to anyone or anything. People can look directly into a Class I laser all day without any damage to their eyes. Supermarket checkout scanning systems and video-disc readers are examples of Class I lasers.

Class II lasers are those that generate a visible beam with a power rating **not** exceeding 1 mW (one thousandth of a watt). Most helium-neon lasers used in classroom demonstrations are Class II lasers; therefore, Class II lasers are often called "demonstration lasers." These lasers are required to have a warning label, a protective housing, an indicator to show when the power is on, and a method to block the beam without turning off the power. These lasers will have a yellow **CAUTION** sign on them that warns the user not to stare directly into the beam.

Class III lasers produce enough power to be dangerous to a person's eye. The beam from a Class III laser can cause eye damage before the blink reflex can block the beam. The damage could result in small blind spots in the person's vision. These lasers are labelled with a red and white **DANGER** sign warning people to avoid getting the direct beam into the eye. They also have a key-activated master switch and a delay mechanism to help prevent accidental exposure to the laser beam.

Class IV lasers produce serious eye damage even from scattered reflections of the beam. These lasers will also produce serious skin burns if a person is exposed to the beam. The person operating a Class IV laser must take precautions to avoid being hurt. He or she must use special glasses to protect the eyes and direct the beam to a safe target area. When Class IV lasers are used to cut or weld metals, or for other applications, they are usually enclosed by a cabinet so that people cannot be exposed to the beam. When enclosed in a cabinet, the laser is safe to use without eye or skin protection. Class IV lasers exceed 5 mW power output.

Specifications for the laser to be used in Lab Activity Sheet 1

The laser used in Lab Activity Sheet 1, "Simulate Satellite Communication," should be a Class II laser that is modulated to transmit audio signals.

Teacher Supplement 5—Laser Caution Sign

Courtesy of the Technology Education Division, Oklahoma Department of Vocational and Technical Education, Stillwater, Oklahoma.

Exploring Communication Technology

Optional Assignment Sheet 2—Sketch an Object

Name _____ Date _____

Evaluation criteria	Rating
Directions have been followed.	_____
Pictorial sketch completed in Part A is neat, thorough, and accurate and was drawn according to the guidelines outlined in Optional Student Supplement 1.	_____
Multiview sketch completed in Part B is neat, thorough, and accurate and was drawn according to the guidelines outlined in Optional Student Supplement 1.	_____
Overall rating	_____

Evaluator's comments _____

_____

_____

Introduction

Every product of technology begins with an idea. The idea usually is vague and requires a long process of problem solving before the product idea becomes a reality.

Sketches are often the first step in the problem-solving process of turning a product idea into a working reality. Sketches allow the creator to visualize his or her thoughts and to test initial concepts quickly and inexpensively, explore options, and improve ideas before the more complicated, time-consuming, and expensive process of drawing final engineering/drafting plans.

Exercise

Part A **Make a pictorial sketch.**

Activity checklist

Put a checkmark on the blank line before each activity below as you complete it.

_____ 1. Read Optional Student Supplement 1, "The Basics of Making Engineering/Drafting Sketches."

_____ 2. Obtain the following supplies from your instructor:

- A pad of drawing paper with a grid of non-copying blue lines
- A hard (4H) drawing pencil
- A soft (2H) drawing pencil
- Eraser

_____ 3. Select a simple object to sketch. Select one of the objects in the list below, or select another simple object of your choice. Write the name of the object on the blank line below.

Simple objects you may select to draw:

- Paper weight
- Pencil holder
- Table
- Trash can
- Flower pot

Object you select to draw _____

_____ 4. Have your instructor approve the object you have chosen to draw.

_____ 5. Make a pictorial sketch of the object you have selected and your instructor has approved. Follow the guidelines in Optional Student Supplement 1 in completing your sketch.

_____ 6. Turn in your pictorial drawing to your instructor.

_____ 7. Your instructor will return your drawing with suggestions for improvement. Make the improvements your instructor suggests, and then, return your drawing to your instructor for final evaluation.

Part B **Make a multiview sketch.**

Activity checklist Put a checkmark on the blank line before each activity below as you complete it.

_____ 1. Review Optional Student Supplement 1, "The Basics of Making Engineering/Drafting Sketches."

_____ 2. Make a multiview sketch of the object you selected in Part A of this assignment. Use the same supplies you obtained in Part A, also.

_____ 3. Turn in your multiview sketch to your instructor.

_____ 4. Your instructor will return your drawing with suggestions for improvement. Make the improvements your instructor suggests, and then, return your drawing to your instructor for final evaluation.

Permission to duplicate this assignment is granted.

Optional Student Supplement 1—The Basics of Making Engineering/Drafting Sketches

Introduction

People use sketches to record their ideas quickly and inexpensively, to show others a design idea in visual form, and to "think through" the solution to a problem. For example, engineers use sketches to present their ideas to drafters who then prepare finished technical drawings.

Two types of sketches are made by engineers to present their ideas to drafters: pictorial sketch and multiview sketch.

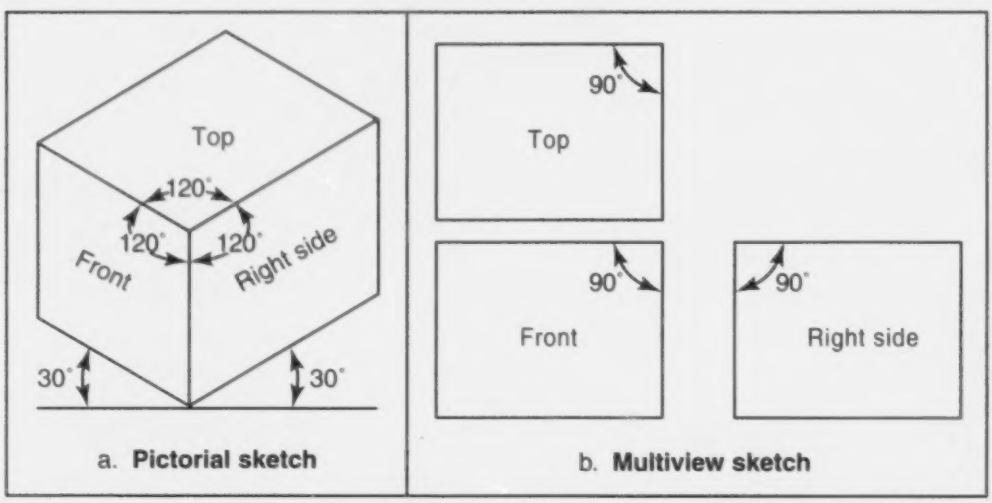
Pictorial sketch

A *pictorial sketch* is a picture-like, three-dimensional drawing of an object as it would appear to the viewer's eye. Figure 1-a shows a pictorial sketch of a cube.

Multiview sketch

A *multiview sketch* is a drawing showing the separate views of an object, arranged so that each view is related to the other views. Figure 1-b is an example of a multiview sketch of the cube presented in Figure 1-a.

Figure 1



a. **Pictorial sketch**

b. **Multiview sketch**

General sketching techniques

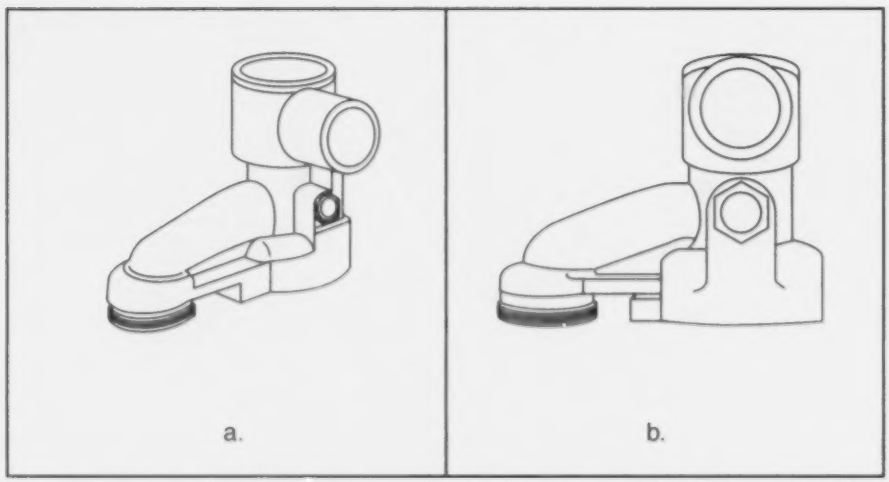
- Use grid paper with noncopying blue lines to help keep the sketch in proportion.
- Use a hard drawing pencil to sketch in guidelines and a soft drawing pencil to darken in details.
- Keep the drawing pencils sharp so that you will create clean, sharp lines.
- Hold the pencil lightly and comfortably as you draw.

- Pulling the drawing pencil produces a smoother line. Therefore:
  - — Vertical lines should be drawn by pulling the pencil down from the top of the drawing to the bottom.
  - — Right-handed people should draw horizontal lines by pulling the pencil from the left to the right, and left-handed people should draw horizontal lines by pulling the pencil from the right to the left.
  - — Draw diagonal lines by turning the paper so that you are actually pulling the pencil as for drawing a horizontal line.
- Keeping your eye directed to where you will be drawing (rather than where you have drawn) will help you produce a straighter line.

Steps in making a sketch

Step 1: Decide which type of sketch you are going to make: pictorial or multiview. If making a pictorial view, choose the view that will show the best overall shape of the object. In Figure 2, View a would be the better view.

Figure 2

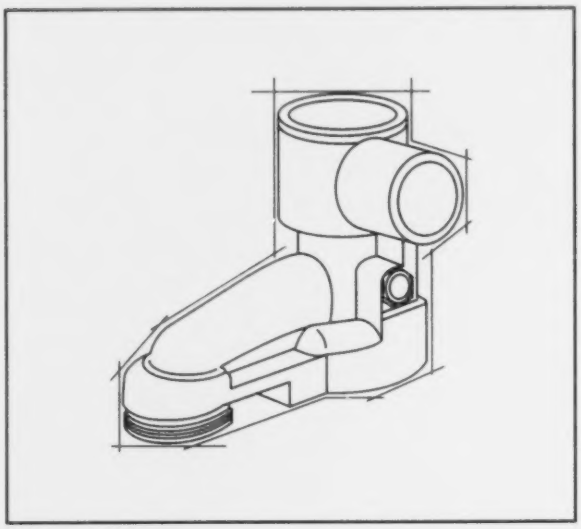


Step 2: Sketch in light horizontal guidelines to establish the height of the object. See Figure 3.

Step 3: Sketch in light vertical guidelines to establish the width and depth of the object. See Figure 3.

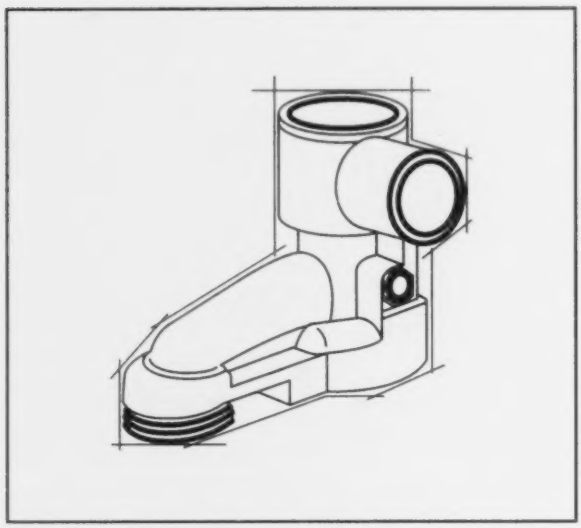
Step 4: Sketch in any light diagonal guidelines to complete the outline of the object. See Figure 3.

Figure 3



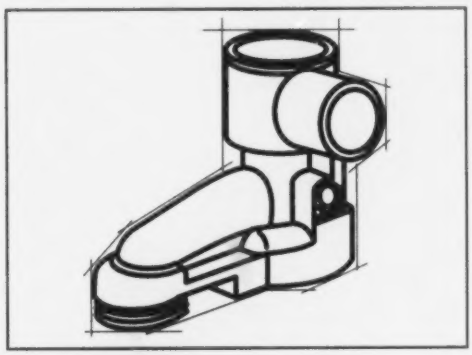
Step 5: Lightly sketch in interior details such as lines, arcs, circles, and ellipses. See the sections below on sketching circles and ellipses. See Figure 4.

Figure 4



Step 6: Darken in the outline and the inside details. See Figure 5.

Figure 5



Step 7: Erase any distracting guidelines.

Note: Even though the steps listed above may seem tedious, do not skip any of these steps; the results of following the procedure exactly will be worth your effort.

Steps in sketching circles

Step 1: Sketch in light guidelines to create center lines for the circle. See Figure 6-a.

Step 2: Sketch in light guidelines to create a box the size of the diameter of the required circle. See Figure 6-b.

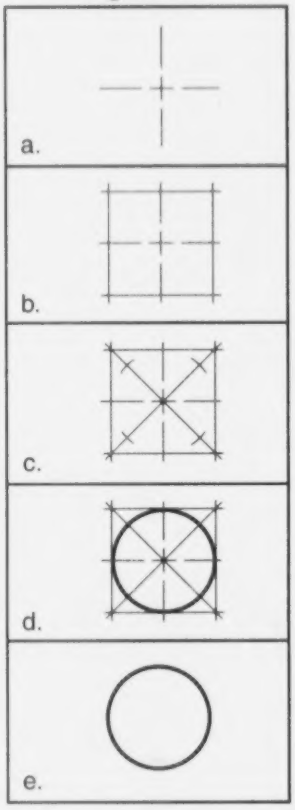
Step 3: Sketch in light diagonal guidelines inside the box. See Figure 6-c.

Step 4: Sketch in light arcs on the diagonal lines equal to the radius of the required circle. See Figure 6-c.

Step 5: Rotate your wrist in a circular motion to sketch in a light guideline that connects the arcs. See Figure 6-d.

Step 6: Erase the guidelines and darken the lines for the completed circle. See Figure 6-e.

Figure 6



Steps in sketching ellipses

Step 1: Sketch in light guidelines to create center lines for the ellipse. See Figure 7-a.

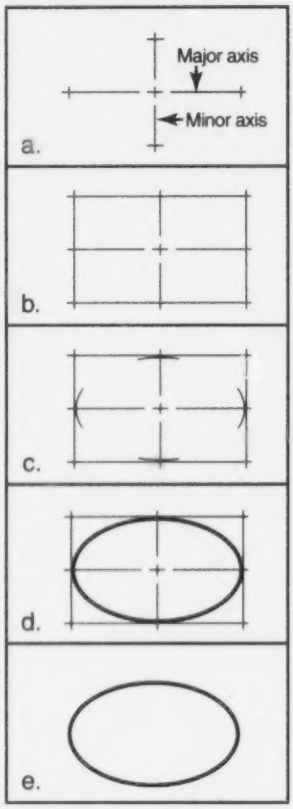
Step 2: Sketch in light guidelines to create a box the size of the major and minor axes of the required ellipse. See Figure 7-b.

Step 3: Sketch in light arcs at the points where the center lines cross the lines of the box created in Step 2. See Figure 7-c.

Step 4: Rotate your wrist in a circular motion to sketch in a light guideline that connects the arcs. See Figure 7-d.

Step 5: Erase the guidelines and darken the lines for the completed ellipse. See Figure 7-e.

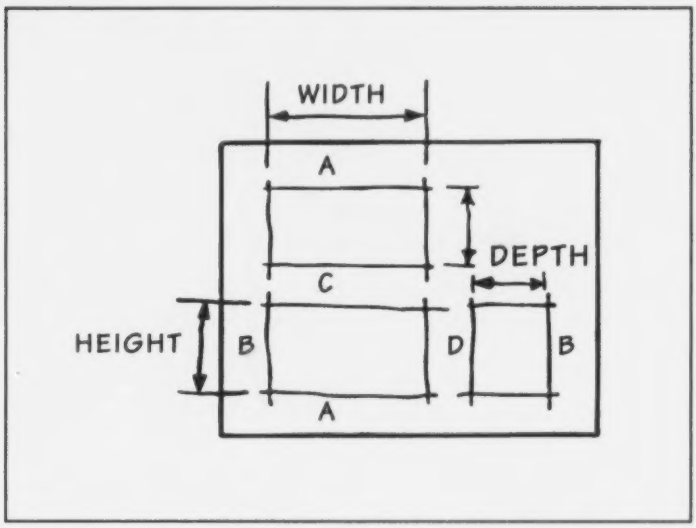
Figure 7



Guidelines for locating the various views of a multiview sketch

- When the drawings are completed, the views should be located so that there will be equal distance between the top of the drawings and the top of the page and between the bottom of the drawings and the bottom of the page. See Figure 8 on the next page.
- When the drawings are completed, the views should be located so that there will be equal distance between the left side of the drawings and the left side of the page and between the right side of the drawings and the right side of the page. See Figure 8.
- The depths of the drawings showing the top and side views of the object must be equal. See Figure 8.

Figure 8



Permission to duplicate this supplement is granted.

Optional Assignment Sheet 3—Use a CAD System to Complete a Multiview Drawing

Name _____ Date _____

Evaluation criteria	Rating
Directions have been followed.	_____
Completed multiview drawings are neat, thorough, and accurate.	_____
Directions in the manufacturer's manual for the CAD system were followed while completing the multiview drawing.	_____
Overall rating	_____

Evaluator's comments _____

_____

_____

Introduction

After original concepts or designs take shape in sketches, formal engineering/drafting plans are made. These plans consist of detailed drafted drawings with precise specifications and measurements. Drafters complete these drawings either manually with drafting tools such as T-squares, triangles, protractors, compasses, pencils, and pens, or with a computer-aided drafting (CAD) system.

To complete this assignment, you will use a CAD system to make a formal engineering/drafting multiview drawing of the object you sketched in Part B of Optional Assignment Sheet 1.

Exercise

Activity checklist

Put a checkmark on the blank line before each activity below as you complete it.

_____ 1. Read Optional Student Supplement 2, "CAD Basics."

_____ 2. Read the operator's instructions your instructor will supply for the CAD system in your lab.

_____ 3. Make a multiview CAD drawing of the object you sketched in Part B of Optional Assignment Sheet 1.

_____ 4. Turn in your CAD drawing to your instructor.

Optional Assignment Sheet 3

_____ 5. Your instructor will return your drawing with suggestions for improvement. Make the improvements your instructor suggests, and then, return your drawing to your instructor for final evaluation.

Permission to duplicate this assignment is granted.

Optional Student Supplement 2—CAD Basics

Introduction

A CAD system has three essential features: the person who is using the system, the hardware, and the software. *Hardware* is the equipment that makes up the CAD system. Hardware includes input devices, the information-processing unit (IPU), memory-recording and storage devices, and output devices. See Figure 1 on the next page.

The following items are types of **input devices**:

- Digitizer tablet
- Graphic tablet
- Light pen
- Keyboard
- Mouse

The following items may be part of the **IPU**:

- Mainframe
- Microcomputer
- Terminal to mainframe

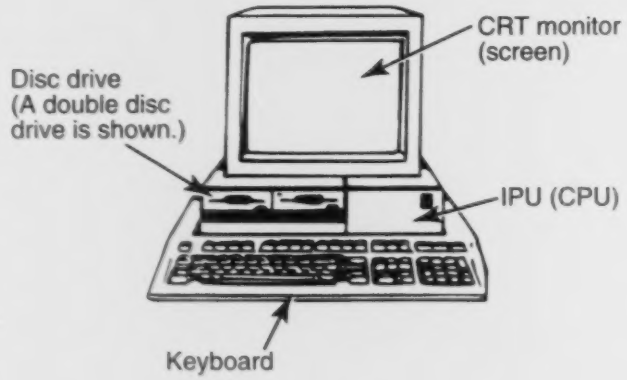
The following items are used for memory recording and storage:

- Floppy disc
- Hard-disc drive
- Magnetic tapes

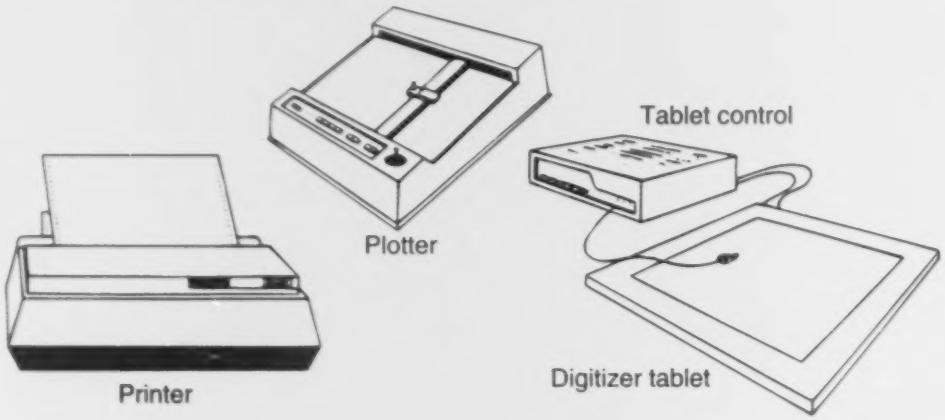
The following items are types of **output devices**:

- Plotter
- Printer
- CRT (for immediate visual output)
- Photographic equipment

Figure 1



a. **Basic microcomputer-system hardware**



b. **Optional hardware**

Optional Student Supplement 2

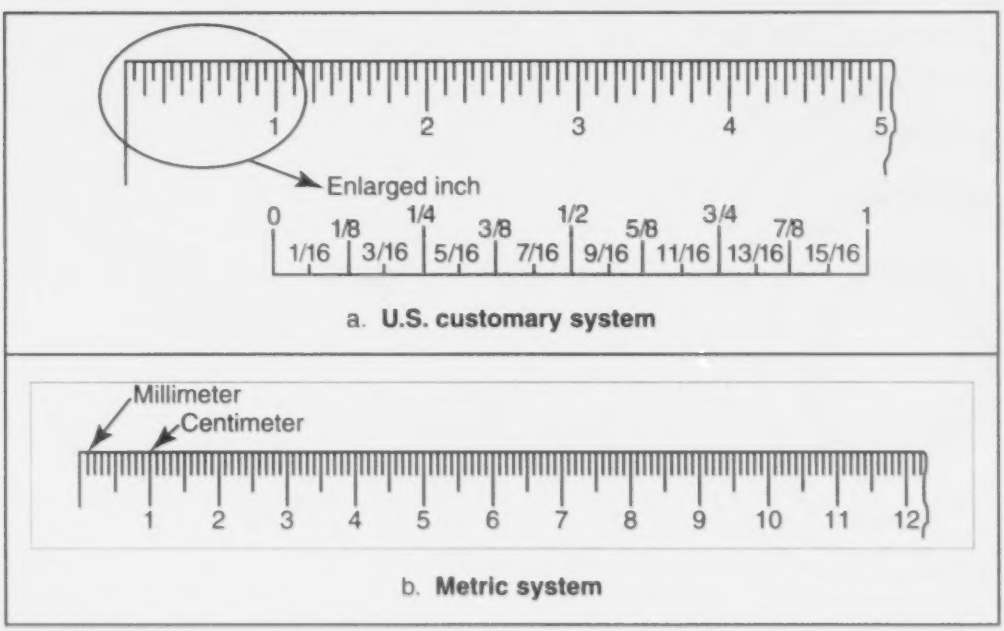
Lines used in drafting

- Border line (very thick)
- Visible line (thick)
- Dimension line (thin)
- Extension line (thin)
- Hidden line (medium)
- Center line (thin)
- Cutting-plane line (thick)
- Section line (thin)
- Phantom line (thin)

Systems of measurement used in drafting

- U.S. customary system, based on the inch and subdivisions of the inch (1/16, 1/8, 1/4, 1/2-inch, etc.). See Figure 2-a.
- International system of metric measurement, based on millimeters and centimeters. See Figure 2-b.

Figure 2



a. **U.S. customary system**

b. **Metric system**

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Exploring Communication Technology

Optional Assignment Sheet 4—Design a Web Page

Name _____ Date _____

Evaluation criteria	Rating
Directions have been followed.	_____
Web-page message is clearly presented and logically organized to link to other pages on the Web site.	_____
Overall rating	_____

Evaluator's comments _____

_____

_____

Introduction

The Internet is among the most exciting and fastest-growing communication technologies. It links millions of computers from all around the world and allows their users to share graphics, sound, and videos almost instantly. With a number of software programs for building Web pages already available and with others on the way, the Internet is becoming a major communications medium and is promising to become even more important in the future. This assignment will introduce you to the fundamentals of Web-page design.

Exercise

Activity checklist

Put a checkmark on the blank line before each activity below as you complete it.

_____ 1. Read Optional Student Supplement 3, "Web Basics."

_____ 2. Read the operator's instructions your instructor will supply for the Web page-building software used in your lab.

_____ 3. Design a Web page using the Web page-building software used in your lab. Your Web page must present a portion of a message for a Web site that explains the purpose of the technology education classes in your school and portrays some of the activities conducted in those classes.

_____ 4. Have your instructor review your Web-page design.

_____ 5. Your instructor will make suggestions for improvement to your Web-page design. Make the improvements your instructor suggests, and then, have your instructor review your Web-page design for final evaluation.

Permission to duplicate this assignment is granted.

Exploring Communication Technology

Optional Student Supplement 3—Web Basics

Introduction

The different software programs for building Web pages vary from one to the other, but they all use the same basic technology. The information below will help you understand the user's manual for the specific Web page-building software used in your technology education classroom. First, study this student supplement. Next, study the user's manual for the software program used in your classroom. Then, spend some time browsing the Web to see how others have used effective design in building their Web pages. Finally, build the Web page called for in Optional Assignment Sheet 3.

Terms and definitions used in page-building software manuals

Terms and definitions associated with the Web

- **Network**—A system of independent computers connected by telephone lines to a main computer, or *server*. All messages to and from any member of the network are routed through the main computer that serves the network.
- **Internet** (the Net)—A collection of interconnected networks. Messages from one network on the Internet to another network on the Internet can be routed through any one or more of the interconnected network servers.
- **World Wide Web** (WWW)—A system of many different Internet technologies that is used to simplify the process of searching for information on the Internet.

Terms and definitions associated with Web-page technology

- **Browser**—A tool that searches the World Wide Web for information specified by the user as topics or key words to be researched.
- **Download**—Transferring information from a storage device on one computer to a storage device on another computer.
- **Load**—Transferring information from a storage device on one computer to the monitor on another computer. When information is *loaded*, the information is not stored in the second computer's memory.
- **Hypertext transfer protocol** (HTTP)—System used to mark Web documents so that a Web browser can *recognize* them.
- **Hypertext markup language** (HTML)—The computer language used to build Web pages.
- **Hyperlink** (link)—Items on a Web page that lead to other items on the same Web page, to another page on the same Web site, or to pages on other Web sites.
- **Uniform resource locator** (URL)—The *address* of any item on the Web. Every bit of text, sound, graphic, or video on the Web has a URL.

- **Web site**—A page or a group of pages located together on the Web.
- **Web page**—One monitor image similar to one page in a book or a document. A Web page can include text, graphics, sound, video items, and links to other Web pages and sites.
- **Home page**—A page on a Web site that works much like the table of contents in a book; it usually includes introductory information about the site and a directory with links to the site's other pages and items.

Basics of Web-page design

The basic elements of good visual and audiovisual design you studied in the student edition also apply to the design of a quality Web page—just as they would to any visual or audiovisual message. However, there are some rules of good design that apply specifically to the design of a quality Web page:

- The best Web-page designs are relatively simple; they use plain backgrounds and graphics and sounds that will load quickly onto the viewer's computer monitor.
- The best Web-page designs are clear and straightforward, and items on the page that are linked to other pages or sites are linked logically.
- Good Web-page designers avoid the temptation to use every tool available in the page-building software program. They select only a few tools per page, and use those few tools well to create an interesting, coherent page.
- Most Internet users must pay for their time on-line; they purchase this time by the minute or the hour. Therefore, users are impatient with pages that take longer than 20 to 30 seconds to load, and they rarely spend more than a few minutes at a site. The more complicated you make your Web page or site, the more difficult and time-consuming it will be for the user to *navigate*. Therefore, it is essential that you keep your message direct, concise, and visually appealing in order to compete with the millions of other pages and sites on the Net.

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Exploring Communication Technology

Answers to Assignment Sheets

Answers to required assignment sheets in student edition

Assignment Sheet 1—Answers will vary. Student performance should be evaluated according to the criteria listed on the assignment sheet.

Assignment Sheet 2—Answers will vary. Student performance should be evaluated according to the criteria listed on the assignment sheet.

Assignment Sheet 3—Answers will vary. Student performance should be evaluated according to the criteria listed on the assignment sheet.

Assignment Sheet 4—Answers will vary. Student performance should be evaluated according to the criteria listed on the assignment sheet.

Assignment Sheet 5—Answers will vary. Student performance should be evaluated according to the criteria listed on the assignment sheet.

Assignment Sheet 6—Answers will vary. Student performance should be evaluated according to the criteria listed on the assignment sheet.

Answers to optional assignment sheets in teacher edition

Optional Assignment Sheet 1

Part A—AIT media, "Introduction to Communication"

1. The process of sending and receiving a message
2. To inform, to persuade, to control tools and machines, to entertain, to educate
3. Speech, pictures, writing, signals
4. Examples of person-to-person communication devices—letters, telephone calls

   Examples of person-to-machine communication devices—computer keyboard, robot controls

   Example of a machine-to-machine communication device—computers linked by modems
5. Sender, message, receiver, feedback
6. The **input** involves the sounds of the voice entering the telephone receiver.

   The **process** involves the transmission of the sounds over the wires.

   The **output** is the sound of the voice issuing from another receiver into a listener's ear.

   The **feedback** is the response of the person hearing the first voice speak, sending a message back to the first speaker.

7. The **input** is the data entered at the keyboard.

   The **process** is the way the computer controls data and converts instructions into actions—calculations, spellcheck, etc.

   The **output** may be a picture, graphic, or words on a screen; a synthesized sound; or directions to another machine to move or switch on or off.

   The **feedback** is the signals verifying that the ordered action occurred or that there were problems.

8. A single message can be replicated or broadcast to reach countless numbers of receivers. It can also be transmitted almost instantaneously over vast distances.

9. The manufacture of fiber optics, computer chips, and satellites helped transmit messages further and more efficiently. The development of the rocket permitted the launching of communication satellites. Electricity powers radios, televisions, and word processors.

Part B—AIT media, "Designing Messages"

1. Audience, content, and form

2. Computers help design graphics. Video technology permits such effects as superimposed images and time-lapse photography.

3. Line, color, readability, space, balance, and unity

Part C—AIT media, "Producing and Transmitting Messages"

1. Sender, message, receiver, and feedback

2. Newspaper story; Live Aid concert

3. Computers, typesetting, computerized photography, paste-up, color stripping, singing

4. Computer networks, telephones, lasers, facsimile scanner (FAX machine), satellites and satellite dishes, television antennas, broadcast signals, fiber optics

5. Computer data, telephone conversations, television signals

6. Television cameras, microphones, antennas, satellites

   Manufacture of speakers, vans, television sets; construction of the stage, highways, parking lots, stadium; transportation of people and equipment by plane, bus, car, van

7. A blueprint or plan

   Speeches, ads, and press events

   Telephone conversations, letters, asking questions in class, putting up posters, homework exercises, participating in music or drama productions, selling items to raise money for some group or program

8. Videophones may be developed so that we see the person we are talking to; it is already as easy and quick to transmit visual material—documents, pictures, graphs—by using FAX machines as it is to transmit voices over long distances.

Part D—AIT media, "Evaluating Messages"

1. Feedback is the reaction or reply to a message; how people respond to the message. It is necessary to have feedback in communication to evaluate the effectiveness of a message; to give continuing direction and correction; and even to avoid tragedy as in the case of the astronauts.

2. Money contributed after the Live Aid concert showed that the message had been received and that it had elicited a response. Engineers at Mission Control were able to respond to the astronauts' messages and give the feedback that corrected the problems on the rocket. TV and radio rating systems help broadcast companies stay in tune with their listeners' preferences.

3. Improvements in the speed and efficiency with which messages can be transmitted and in which feedback can be returned have brought people steadily closer together. Actions and events in widely separated areas of the globe now have almost immediate effects on each other.

4. Instant rating systems for media events, videophones, ways of instantly and continually monitoring the effect of experimental drugs, increasingly sophisticated cameras that immediately let you see what you have filmed, and possible development of communication with outer space and nonhuman creatures may enable all beings to affect and respond to each other continually.

   Instantaneous feedback may correct mistakes or problems before they become severe. It may also encourage changes too quickly, before long-range results are known: new television programs are often discontinued after a single showing before they have time to build an audience.

Optional Assignment Sheet 2—Answers will vary. Student performance should be evaluated according to the criteria listed on the assignment sheet.

Optional Assignment Sheet 3—Answers will vary. Student performance should be evaluated according to the criteria listed on the assignment sheet.

Optional Assignment Sheet 4—Answers will vary. Student performance should be evaluated according to the criteria listed on the assignment sheet.

Exploring Communication Technology

Written Test

Name _____ Score _____

1. Define the terms *communication system* and *interference*. Write your answers on the blanks provided beside each of the terms below.

   a. **Communication system** _____

   _____

   _____

   b. **Interference** _____

   _____

   _____

2. Define the stages in a basic communication system. Write your answers on the blanks provided beside each of the stages listed below.

   a. **Stage 1: Input** _____

   _____

   b. **Stage 2: Process** _____

   _____

   c. **Stage 3: Output** _____

   _____

3. Discuss the forms of interference that can occur at the various stages in a basic ommunication system. Write your answers on the blanks provided beside each of the stages listed below.

   a. **Stage 1: Input** _____

   _____

   b. **Stage 2: Process** _____

   _____

   c. **Stage 3: Output** _____

   _____

4. Discuss the importance of feedback in a basic communication system. Write your answer on the blanks provided below.

5. Define the parts of the process in a basic communication system. Write your answers on the blanks provided beside each of the terms below.

   a. **Transmitter** _____

   b. **Channel** _____

   c. **Receiver** _____

6. List the goals of communication. Write your answers on the blanks provided below.

   a. _____

   b. _____

   c. _____

   d. _____

   e. _____

7. Match the basic types of communication to their correct definitions. Write the correct numbers on the blanks.

_____	a. Communication that does not use words but uses signs, symbols, or behaviors in the message to be delivered	1. Nonverbal
_____	b. Communication that is based on our sense of hearing	2. Verbal
_____	c. Communication that is based on our sense of sight	3. Visual
_____	d. Communication that uses words in the message to be delivered	4. Audio
_____	e. Communication that is based on both our sense of sight and our sense of hearing	5. Audiovisual

8. Arrange in order the steps in designing a message to be communicated. Write the correct numbers (1 through 7) on the blanks below.

_____ a. Transmit the message.

_____ b. Determine the audience.

_____ c. Plan the initial design of the message.

_____ d. Determine the content of the message.

_____ e. Decide which format—visual, audio, audiovisual—would be the best format for the content of the message you want to deliver to the audience you have selected.

_____ f. Obtain feedback and redesign the message if necessary.

_____ g. Produce the message.

9. Name the methods used to plan the initial message design in visual, audio, and audiovisual messages. Write your answers on the blanks beside each of the terms below.

a. **Visual message** _____

b. **Audio message** _____

c. **Audiovisual message** _____

Written Test

10. List some methods used to produce and transmit visual messages. Write your answers on the blanks provided below.

    a. _____

    b. _____

    c. _____

    d. _____

11. List some methods used to produce and transmit audio and audiovisual messages. Write your answers on the blanks provided below.

    a. _____

    b. _____

    c. _____

    d. _____

    e. _____

12. List some emerging communication-transmission technologies. Write your answers on the blanks provided below.

    a. _____

    b. _____

    c. _____

    d. _____

Permission to duplicate this test is granted.

Exploring Communication Technology

Answers to Written Test

1. a. System in which information is exchanged between individuals or machines through a common system of signs, symbols, or behavior
   b. Anything that blocks the communication process

2. a. Message the sender wants to communicate
   b. How the message is sent (transmitted)
   c. Message actually recorded by the person receiving the transmission

3. a. Sender creates a poorly constructed message.
   b. Noise is created during the transmission.
   c. Person receiving the transmission misinterprets the message transmitted or receives a poorly constructed message.

4. Feedback is the term used to describe the contact between the person receiving the transmission and the sender. Feedback closes the loop in a basic communication system by providing a way of comparing the message sent to the message recorded after transmission. Feedback tells the sender whether the person receiving the transmission has understood the message correctly, and if not, helps the sender determine the source of the interference.

5. a. Means of transmitting (sending) a message
   b. Route the message takes (transmission)
   c. Means of accepting a transmitted message

6. Answers may appear in any order.

   - To exchange information
   - To express feelings
   - To solve problems
   - To persuade
   - To control tools and machines

7. a. 1
   b. 4
   c. 3
   d. 2
   e. 5

8. a. 6
   b. 1
   c. 4
   d. 2
   e. 3
   f. 7
   g. 5

9. a. Sketch
   b. Script
   c. Storyboard (sketches) and script

Answers to Written Test

10. Answers may appear in any order.

    - Drafting
    - Photography
    - Printing
    - Desktop publishing

11. Answers may appear in any order.

    - Telephone
    - Radio
    - Audio recordings
    - Television
    - Computer

12. Answers may appear in any order.

    - Laser
    - Microwave
    - Satellite
    - Fiber optic

Exploring Communication Technology

Unit Evaluation Form

Student name _____ Unit rating _____

Assignment-sheet ratings

Assignment Sheet 1—Research a Communication Career Rating _____

Comments: _____

_____

Assignment Sheet 2—Design and Transmit a Nonverbal Message Rating _____

Comments: _____

_____

Assignment Sheet 3—Practice Designing an Interference-Free Verbal Message Rating _____

Comments: _____

_____

Assignment Sheet 4—Design a Visual Message Rating _____

Comments: _____

_____

Assignment Sheet 5—Practice Designing an Interference-Free Coded Message Rating _____

Comments: _____

_____

Assignment Sheet 6—Design an Audiovisual Message Rating _____

Comments: _____

_____

Continue to back of this page.

Unit Evaluation Form

Lab-activity-sheet ratings

Lab Activity Sheet 1—Simulate Satellite Communication Rating _____

Comments: _____

_____

Lab Activity Sheet 2—Take a Series of Photographs Rating _____

Comments: _____

_____

Lab Activity Sheet 3—Simulate Fiber-Optic Communication Rating _____

Comments: _____

_____

Lab Activity Sheet 4—Produce and Transmit an Audiovisual Message Rating _____

Comments: _____

_____

List optional assignments and ratings.

Continue to next page.

Unit Evaluation Form

Written-test scores

Pretest _____ Posttest _____ Other _____

Comments: _____

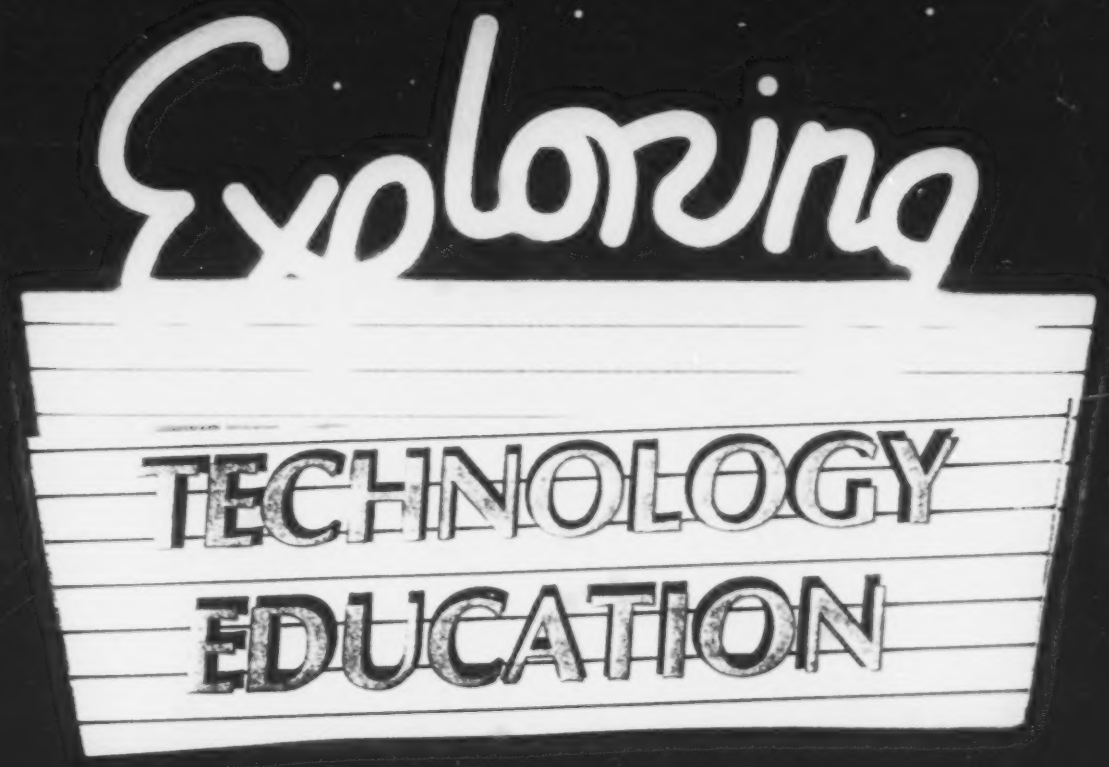
_____

_____

Teacher signature _____ Date _____

Student signature _____ Date _____

Permission to duplicate this form is granted.



Exploring Communication Technology

Student Edition

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Exploring Technology Education:

Exploring Communication Technology

Student Edition

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Exploring Communication Technology

Student Edition

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Exploring Communication Technology

Objective Sheet

Unit objective

After completing this unit, the student should be able to define the stages in a basic communication system and design, produce, and transmit sample nonverbal, verbal, visual, and audiovisual messages. The student should demonstrate these competencies by completing the assignment sheets and lab activity sheets and by scoring a minimum of 85 percent on the written test.

Specific objectives

After completing this unit, the student should be able to

1. Define the terms *communication system* and *interference*.
2. Define the stages in a basic communication system.
3. Discuss the forms of interference that can occur at the various stages in a basic communication system.
4. Discuss the importance of feedback in a basic communication system.
5. Define the parts of the process in a basic communication system.
6. List the goals of communication.
7. Match the basic types of communication to their correct definitions.
8. Arrange in order the steps in designing a message to be communicated.
9. Name the methods used to plan the initial message design in visual, audio, and audiovisual messages.
10. List some methods used to produce and transmit visual messages.
11. List some methods used to produce and transmit audio and audiovisual messages.
12. List some emerging communication-transmission technologies.
13. Research a communication career. (Assignment Sheet 1)
14. Design and transmit a nonverbal message. (Assignment Sheet 2)
15. Practice designing an interference-free verbal message. (Assignment Sheet 3)
16. Design a visual message. (Assignment Sheet 4)
17. Practice designing an interference-free coded message. (Assignment Sheet 5)
18. Design an audiovisual message. (Assignment Sheet 6)
19. Simulate satellite communication. (Lab Activity Sheet 1)

Objective Sheet

20. Take a series of photographs. (Lab Activity Sheet 2)
21. Simulate fiber-optic communication. (Lab Activity Sheet 3)
22. Produce and transmit an audiovisual message. (Lab Activity Sheet 4)

Exploring Communication Technology

Information Sheet

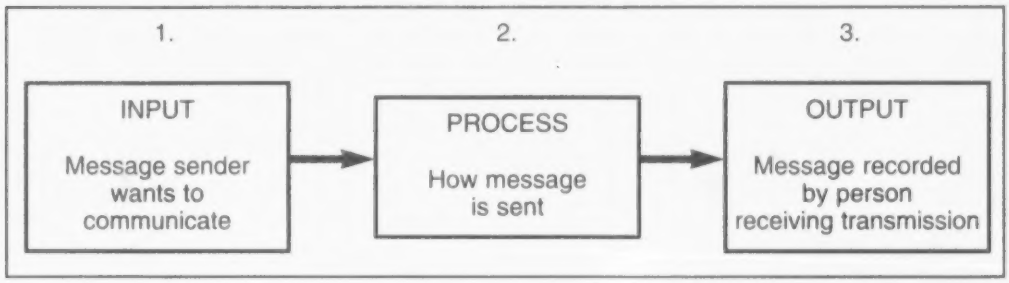
1. **Definitions of the terms *communication system* and *interference***

   - **Communication system**—System in which information is exchanged between individuals or machines through a common system of signs, symbols, or behavior
   - **Interference**—Anything that blocks the communication process

2. **Stages in a basic communication system and their definitions** (see Figure 1)

   - **Stage 1: Input**—Message the sender wants to communicate
   - **Stage 2: Process**—How the message is sent (transmitted)
   - **Stage 3: Output**—Message actually recorded by the person receiving the transmission

   Figure 1: Stages in a basic communication system



3. **Forms of interference that can occur at the various stages in a basic communication system**

   - **Stage 1: Input**—Sender creates a poorly constructed message.
   - **Stage 2: Process**—Noise is created during the transmission.

     Note: *Noise* is the term for a special type of interference created during the transmission process. A common example of noise is the static you hear on your radio as a result of the radio transmission process.

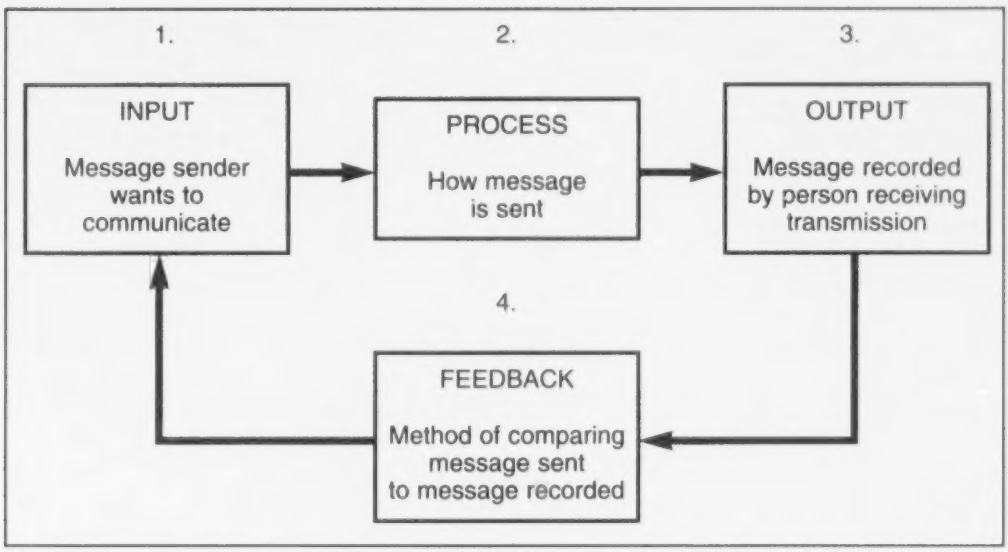
   - **Stage 3: Output**—Person receiving the transmission misinterprets the message transmitted or receives a poorly constructed message.

4. **Importance of feedback in a basic communication system** (see Figure 2)

   - *Feedback* is the term used to describe the contact between the person receiving the transmission and the sender.
   - Feedback closes the loop in a basic communication system by providing a way of comparing the message sent to the message recorded after transmission.

- Feedback tells the sender whether the person receiving the transmission has understood the message correctly, and if not, helps the sender determine the source of the interference.

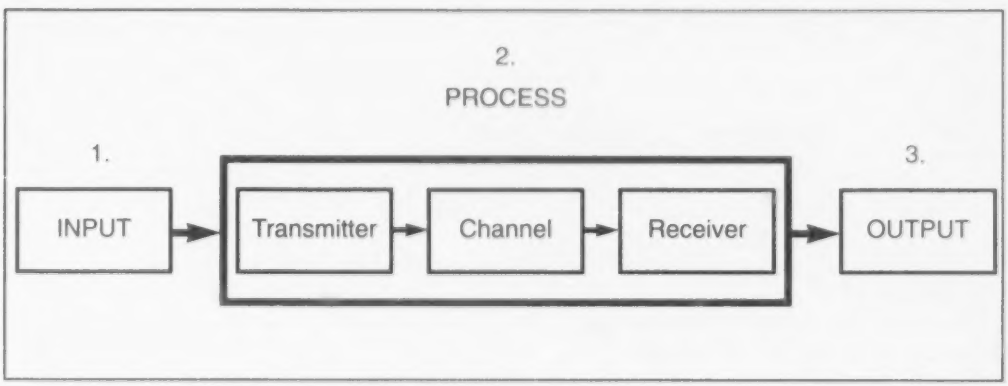
Figure 2: Importance of feedback



5. **Parts of the process in a basic communication system and their definitions** (see Figure 3, Figure 4, and Figure 5)

- **Transmitter**—Means of transmitting (sending) a message
- **Channel**—Route the message takes (transmission)
- **Receiver**—Means of accepting a transmitted message

Figure 3: Parts of the process

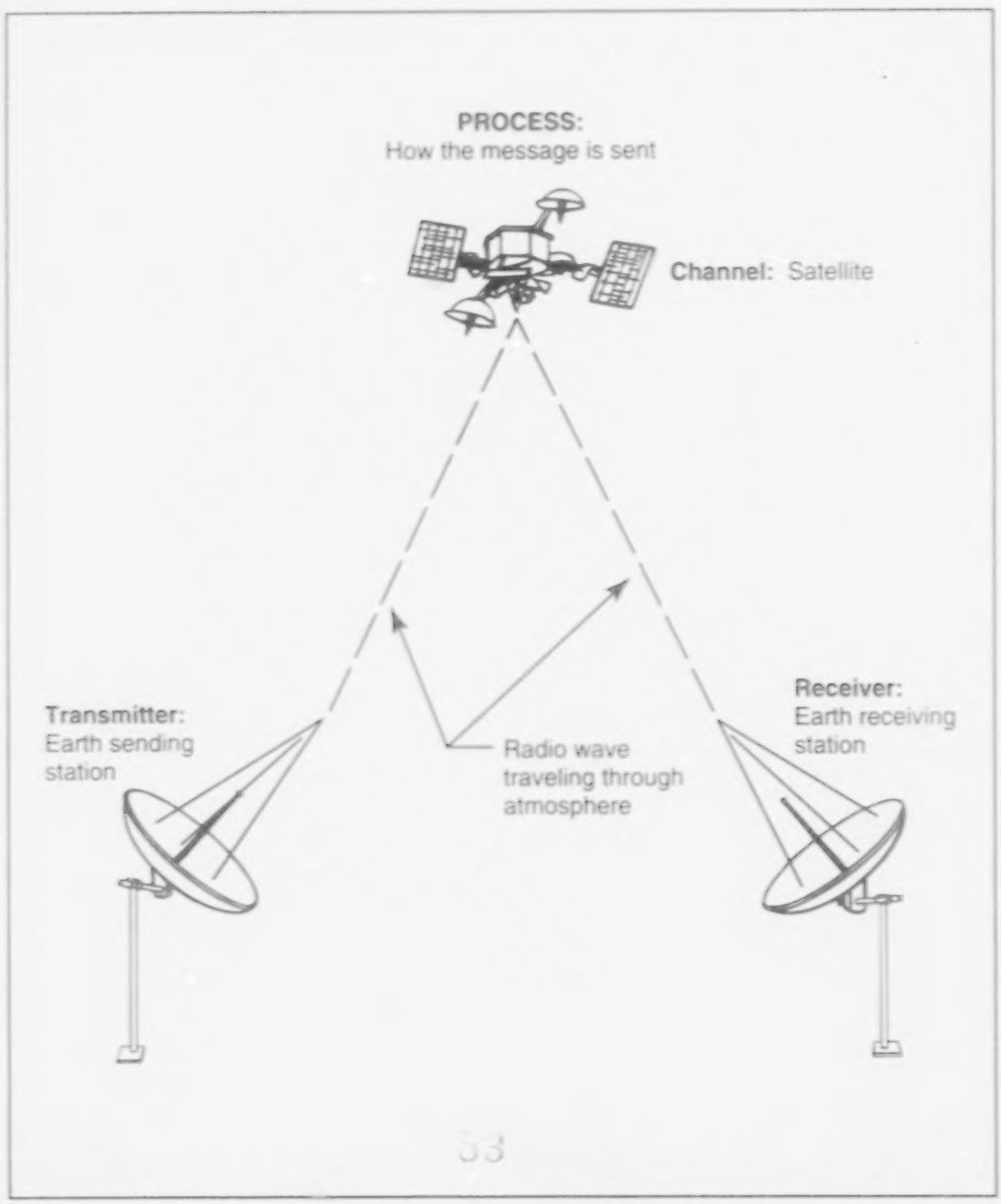


Information Sheet

Example: Parts of the process in a satellite communication system (see Figure 4)

- **Transmitter**—Earth sending station
- **Channel**—Radio beam traveling through the atmosphere and then re-transmitted by satellite
- **Receiver**—Earth receiving station

Figure 4

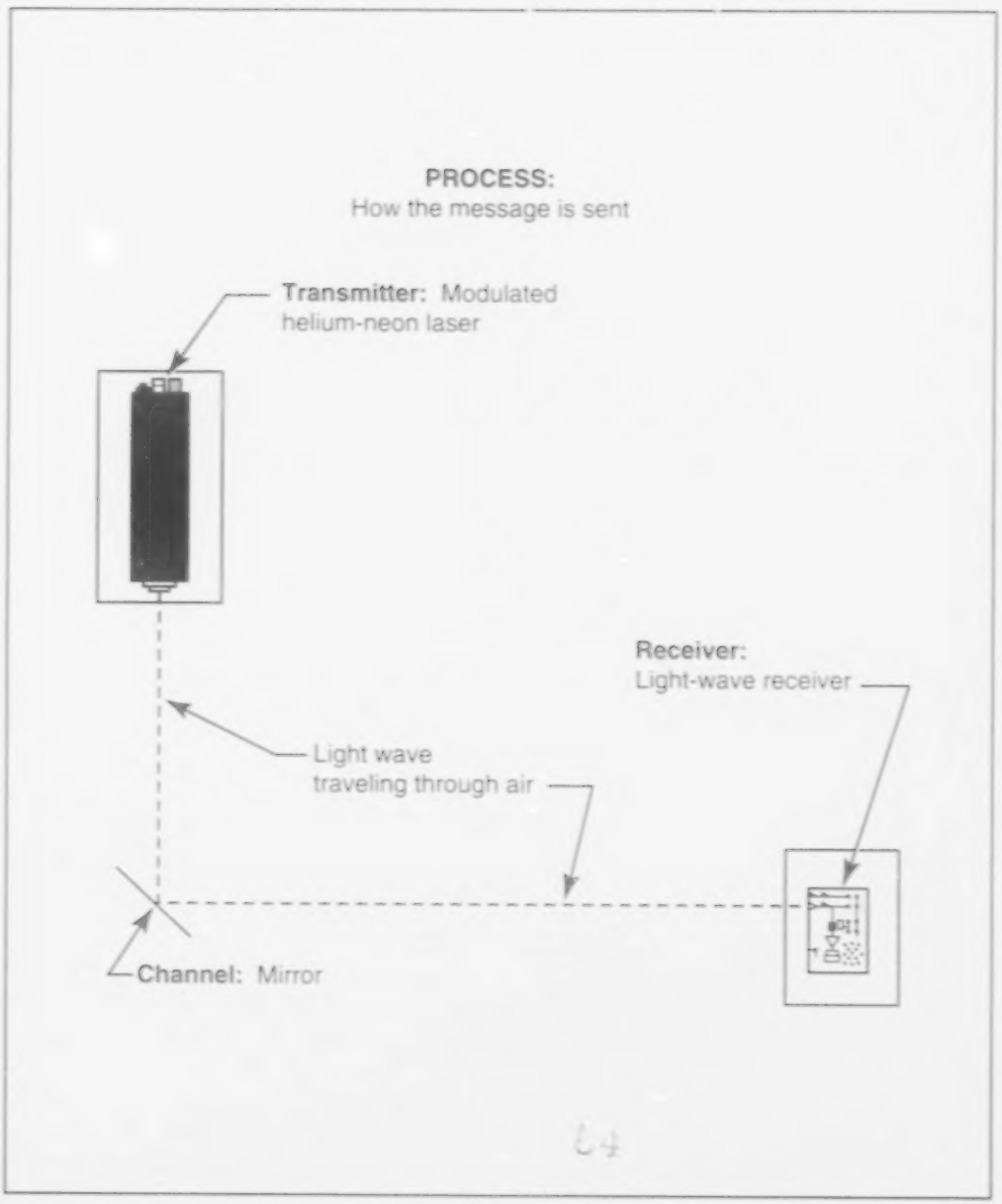


Information Sheet

Example: Parts of the process in a helium-neon laser communication system (see Figure 5)

- **Transmitter**—Modulated helium-neon laser
- **Channel**—Light wave traveling through air and reflected by mirror
- **Receiver**—Light-wave receiver

Figure 5



Information Sheet

6. **Goals of communication**

   - To exchange information
   - To express feelings
   - To solve problems
   - To persuade
   - To control tools and machines

7. **Basic types of communication and their definitions**

   - **Nonverbal**—Communication that does not use words but uses signs, symbols, or behaviors in the message to be delivered

     Examples: Body language; traffic signs that use symbols and not words; drafting symbols; smells; tastes; artistic works such as art, music (without lyrics), sculpture, and mime

   - **Verbal**—Communication that uses words in the message to be delivered

     Note: There are two types of verbal communication—oral and written. In *oral* communication, words are spoken aloud. Conversations and speeches are examples of oral communication. Effective oral communication depends on the abilities of the sender and receiver to speak and hear.

     In *written* communication, words are written. Books, memos, letters, and labels on charts and maps are examples of written communication. This type of communication depends on the abilities of the sender and receiver to read and write.

   - **Visual**—Communication that is based on our sense of sight

     Examples: Drawings, paintings, and illustrations; maps and diagrams; books, magazines, and newspapers; photographs and silent movies; letters and memos; messages on computer monitors and printouts

   - **Audio**—Communication that is based on our sense of hearing

     Examples: Direct one-on-one conversations between people; telephone messages; radio, tape, phonograph, and compact-disc recordings

   - **Audiovisual**—Communication that is based on both our sense of sight and our sense of hearing

     Examples: Theatrical presentations; television, videodisc, and videocassette programs; motion pictures (movies); picture-phone messages; and multi-media computer presentations

Information Sheet

8. **Steps in designing a message to be communicated**

   - **Step 1**—Determine the audience.

     Note: Decide what group of people the message is to be communicated to and identify their characteristics and interests. Examples of groups would be children, parents, business executives, retirees, travelers, teachers, women, men, etc.

   - **Step 2**—Determine the content of the message.

     Note: List the points of information the message is to contain.

   - **Step 3**—Decide which format—visual, audio, audiovisual—would be the best format for the content of the message you want to deliver to the audience you have selected.

     Examples: Book, illustration, photograph, television program, movie, radio announcement, newspaper advertisement, etc.

   - **Step 4**—Plan the initial design of the message.

   - **Step 5**—Produce the message.

   - **Step 6**—Transmit the message.

   - **Step 7**—Obtain feedback and redesign the message if necessary.

9. **Methods used to plan the initial message design in visual, audio, and audiovisual messages**

   - **Visual message**—Sketch

   - **Audio message**—Script

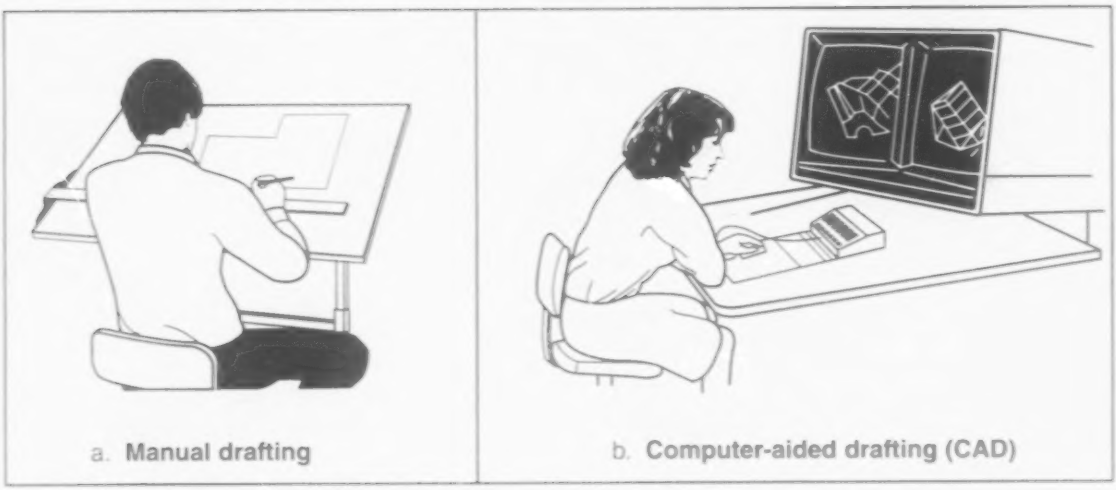
   - **Audiovisual message**—Storyboard (sketches) and script

10. **Some methods used to produce and transmit visual messages**

    - **Drafting**

      Note: Drafting is the universal language of industry and modern technology. The drawings and symbols created by a drafter are used to communicate ideas and specific information. There are two types of drafting: manual drafting and computer-aided drafting (CAD). In *manual drafting*, a drafter uses traditional tools such as triangles, T-squares, and protractors to create his or her drawings by hand (see Figure 6-a). In *computer-aided drafting*, a drafter uses a computer and software to create his or her drawings (see Figure 6-b).

Figure 6: Types of drafting



a. **Manual drafting**

b. **Computer-aided drafting (CAD)**

- **Photography**

Note: In photography, a camera is used to produce an image on a sensitized surface by the action of radiant energy (light). In traditional photography, the sensitized surface is film (see Figure 7). The exposed film is then processed to produce a negative; a print (photograph) is made from the negative. In digital photography, the sensitized surface is a charge-coupled device (CCD), a solid-state chip made up of light-sensitive photosites. When light hits the CCD, the CCD converts the light to electrons, which are then converted to digital information. The digital information is stored in the camera's electronic memory. Using an interface cable, the digital information can be downloaded to a computer, where it can be manipulated and then printed (see Figure 8).

Figure 7: Traditional photography

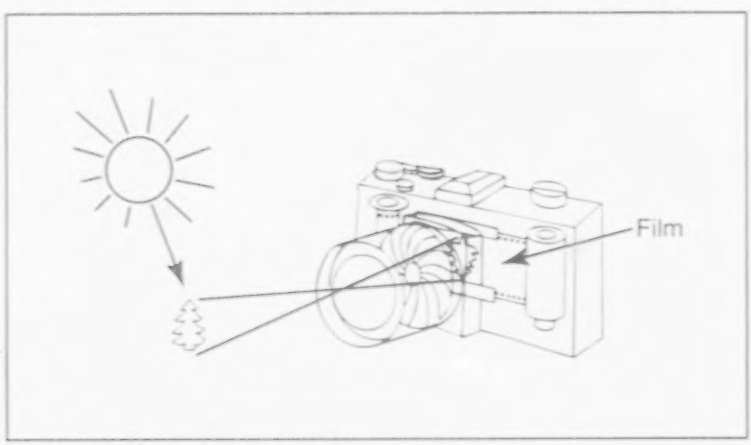
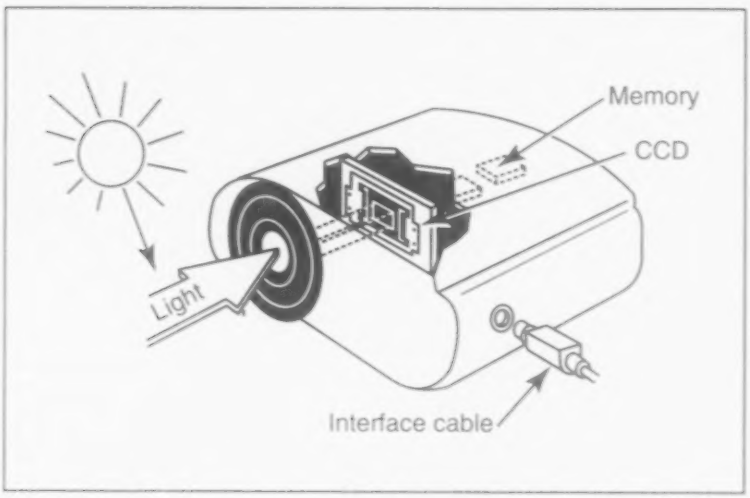


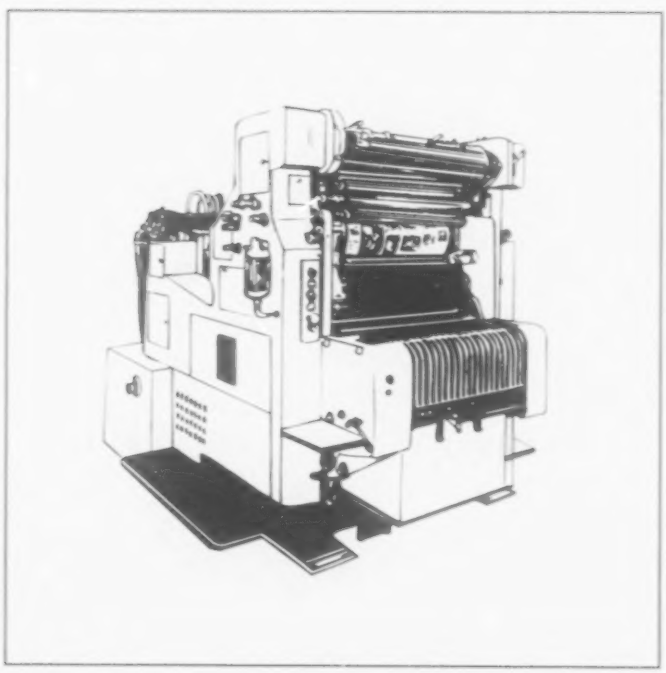
Figure 8: Digital photography



- **Printing**

Note: Printing is a process that uses specially prepared image carriers, presses, and ink or dye to reproduce images on paper (see Figure 9).

Figure 9: Printing press

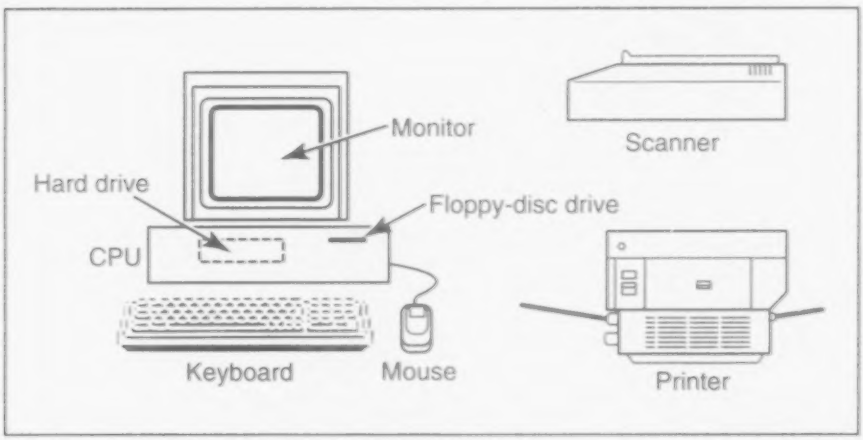


Information Sheet

- **Desktop publishing**

  Note: Desktop publishing uses a personal computer system and appropriate software that combines text and graphics to produce a publication. A basic desktop-publishing system includes a computer (monitor, keyboard, and CPU), software (publishing, graphics, and word-processing), mouse, scanner, and printer (see Figure 10).

Figure 10: Desktop-publishing system



11. **Some methods used to produce and transmit audio and audiovisual messages**

- **Telephone**

  Note: A basic telephone system is an audio-communication system that converts sound into electrical impulses that are transmitted by wire. Telephone companies, however, are now using laser, microwave, satellite, and fiber-optic transmission methods to provide high-quality, lower-cost, long-distance audio-communication service.

- **Radio**

  Note: Radio is a "wireless" audio-communication system that converts sound into electrical impulses that are transmitted through the air by means of electromagnetic waves.

- **Audio recordings**

  Note: To produce audio recordings, sound is converted into electrical impulses that are stored on a variety of media such as phonograph records, cassettes, and compact discs.

- **Television**

  Note: Television is a complex audiovisual-communication system that uses cameras, microphones, monitors, controls, and computers to record and transmit both audio and video messages.

Information Sheet

- **Computer**

  Note: Computers are electronic devices used to store, retrieve, and process information (data). Multi-media computers can be used to organize, manipulate, and transmit both audio and video messages.

12. **Some emerging communication-transmission technologies**

- **Laser**

  Note: The word *laser* comes from the first letter of each word in the phrase "**l**ight **a**mplification by **s**imulated **e**mission of **r**adiation." In laser communication systems, audio and visual signals are transmitted through the atmosphere on beams of coherent electromagnetic radiation.

- **Microwave**

  Note: Microwaves are short electromagnetic waves. In microwave communication systems, audio signals are transmitted through the atmosphere on these electromagnetic waves.

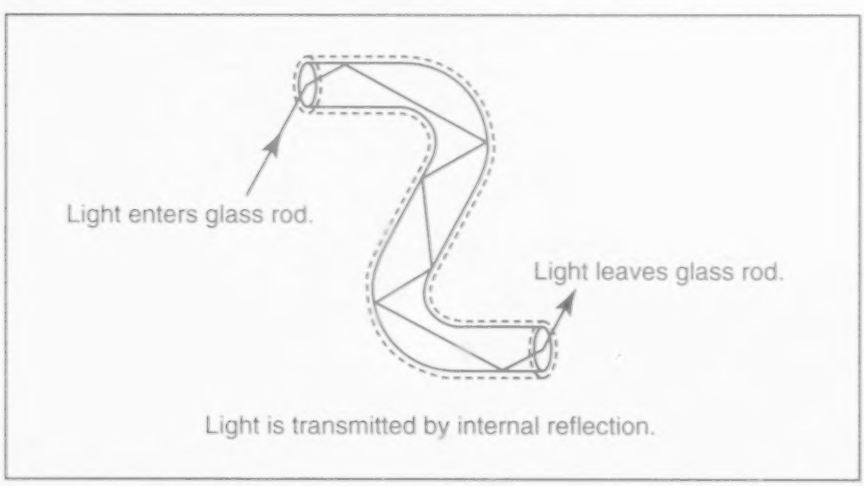
- **Satellite**

  Note: Satellites orbit the earth. In satellite communication systems, telephone companies and television networks use satellites to receive and then re-transmit audio and video messages back to earth stations (see Figure 4).

- **Fiber optic**

  Note: Fiber-optic strands are made of thin, transparent fibers of glass or plastic (see Figure 11). Cables made of these fiber-optic strands are used to transmit messages. For example, telephone companies use fiber-optic cables to transmit sound because fiber-optic cables take less space than traditional copper cables and also carry a greater number of calls with a better-quality sound transmission.

Figure 11: Fiber-optic transmission



Exploring Communication Technology

Assignment Sheet 1—Research a Communication Career

Name _____ Date _____

Evaluation criteria	Rating
Directions have been followed.	_____
Research is thorough and accurate.	_____
Report is in correct format.	_____
Overall rating	_____

Evaluator's comments _____

Introduction

In *Introduction to Technology Education*, Unit 5, "Career-Exploration Process," you learned the process for conducting career research. In this assignment sheet, you will use the skills you learned in Unit 5 to conduct career research in the communication area.

Exercise

Activity checklist

Put a checkmark on the blank line before each activity below as you complete it.

_____ 1. **Read** Student Supplement 1 on page 15. Examples of some of the careers in the communication area are listed in Student Supplement 1. You may be able to name other careers in the communication area, also. **Select one career** you think you would like to explore, and **research that career**. Use the career-exploration process you learned in Unit 5 of *Introduction to Technology Education* in conducting your research.

_____ 2. **Compile the results** of your research, and prepare a **written research paper** to present the information you have compiled. A written research paper should include the following components:

- Title page
- Table of contents
- Introduction
- Body
- Conclusion
- Endnotes/footnotes

Assignment Sheet 1

_____ 3. **Turn in your research paper** to your instructor for evaluation.

_____ 4. Your instructor will return your research paper with suggestions for improvement. Make the improvements your instructor suggests, and then, **return your research paper** for **final evaluation**.

Exploring Communication Technology

Student Supplement 1—Examples of Some of the Careers in the Communication Area

Introduction

The following is a list of just **some** of the careers in the communication area. Use this list as a beginning point in your career-exploration research process. There are many, many more careers in the ever-expanding area of communication.

Careers in commercial art and design

- Designer
- Artist/illustrator

Careers in engineering, drafting, and design

- Engineer
- Designer
- Drafter/CAD operator

Careers in print journalism and publishing

- Writer
- Editor
- Reporter
- Photographer
- Desktop publishing operator
- Press operator
- Bindery worker

Careers in film and broadcasting

- Writer
- Producer
- Director
- Actor/actress
- Computer animator
- Newscaster
- Disc jockey
- Announcer
- Camera operator
- Technician (audio, lighting, etc.)

Careers in the fine arts (theater, music, literature, visual arts)

- Producer
- Director
- Actor/actress
- Technician (audio, lighting, etc.)
- Musician
- Composer
- Dancer
- Writer
- Artist/painter
- Sculptor

Careers in telecommunication (computer, telephone, satellite)

- Computer programmer
- Technician (satellite, laser, microwave, fiber-optic, etc.)

Exploring Communication Technology

Assignment Sheet 2—Design and Transmit a Nonverbal Message

Name _____ Date _____

Evaluation criteria	Rating
Directions have been followed.	
Nonverbal messages described in the log in Part A are identified correctly.	
Descriptions completed in Part A are complete, relevant, and well thought out.	
Nonverbal message created in Part B effectively communicated selected message.	
Overall rating	

Evaluator's comments _____

Introduction

Because many of the formal communications you receive daily are through the radio, books, newspapers, etc., when you think of *communication,* you usually think of *verbal communication*—communication based on spoken or written words. However, if you will begin to notice, many of the messages you receive daily are in the form of *nonverbal* communication—communication that does not use words but uses signs, symbols, or behaviors in the message to be delivered.

Nonverbal communication can be as funny as holding your nose to show that something smells bad, or it can be much more serious. For example, natural gas is odorless, so refineries add the distinctive natural-gas odor to communicate to us a dangerous natural-gas leak; manufacturers add foul tastes to poisons to communicate warnings not to swallow their products; and symbols on traffic signs are used to signal dangerous situations to drivers.

In this assignment sheet, you will describe some of the nonverbal messages you receive in just one day, and then, you will design a nonverbal message and use only body language—a form of nonverbal communication—to transmit the message.

Assignment Sheet 2

Exercise

Part A **Describe the nonverbal messages you receive in one day.**

Activity checklist Put a checkmark on the blank line before each activity below as you complete it.

_____ 1. **Read** the definition of *nonverbal communication* in **Objective 7** of the information sheet and note the examples listed in that part of the objective.

_____ 2. **Read Student Supplement 2**, "Body Language—A Form of Nonverbal Communication" on page 21.

_____ 3. **Keep a log** of the nonverbal messages that you both send and receive for one full day. In your log, take quick notes of the circumstances under which you sent or received the nonverbal message and state the message you wished to send or the message you received.

_____ 4. From the notes in your log, **select the ten most unusual** or **interesting** nonverbal messages you sent or received. Then, **write a description** of each of these ten. In each description, completely describe the message that was intended, how the nonverbal message was sent or received, and the effectiveness of the message and transmission.

_____ 5. **Turn in your daily log and** your ten **descriptions** to your instructor.

_____ 6. Your instructor will return your log and descriptions with suggestions for improvement. Make the improvements your instructor suggests, and then, **return your log and descriptions** to your instructor **for final evaluation**.

Part B **Design and transmit a nonverbal message, using only body-language signals.**

Activity checklist Put a checkmark on the blank line before each activity below as you complete it.

_____ 1. **Read Objectives 6, 7, 8, and 9** in the information sheet.

_____ 2. **Review Student Supplement 2**, "Body Language—A Form of Nonverbal Communication."

_____ 3. **Design your body-language message:**

On a separate sheet(s) of paper, which you label "Message Design,"

- State the audience for your message.
- State the purpose of your message.

Assignment Sheet 2

- List the points of information you want the message to contain.
- Plan the initial design of the message—do thumbnail sketches of the various body-language signals you will use to transmit your message.

Note: Thumbnail sketches are small freehand sketches made quickly to show design ideas. The example below shows three thumbnail sketches (or *thumbnails*) of design ideas for a book cover.

Example:

_____ 4. **Transmit your message:**

- Give your instructor your "Message Design" paper with the thumbnail sketches you have made of the various body-language signals you will use to transmit your message, and then, transmit your body-language message to your instructor.

_____ 5. **Obtain feedback and redesign the message if necessary:**

- Your instructor will return your "Message Design" paper to you along with suggestions for improving your message design and transmission. Make the improvements your instructor suggests, and then, transmit your message to your instructor again for final evaluation.

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Exploring Communication Technology

Student Supplement 2—Body Language—A Form of Nonverbal Communication

Introduction

The signals (gestures, expressions, and stances) used in body language make up one type of nonverbal communication. Body language often communicates messages about feelings and attitudes. Some of the messages body-language signals communicate are positive messages, some are negative, but most of these signals are readily identifiable by all the people within a certain society. Some of the readily identifiable positive and negative body-language signals used in American society are listed below. Read this list, and then, see if you can add some other body-language signals you know to this list.

Positive gestures, expressions, and stances

- **Maintaining eye contact with a speaker**—Signals that the listener is listening attentively
- **Smiling**—Signals agreement, pleasure, or humor
- **Assuming an open stance** (arms unfolded, legs uncrossed)—Signals friendliness or being receptive and open
- **Stroking your chin with your hand**—Signals thoughtful consideration
- **Sitting slightly forward in your chair while listening**—Signals that the listener is listening attentively
- **Leaning slightly forward toward a person while you are standing**—Signals that the listener is listening attentively
- **Nodding your head up and down**—Signals agreement or support

Negative gestures, expressions, and stances

- **Tapping fingers, cracking knuckles, wringing hands, tugging hair**—Signals lack of confidence, uneasiness, boredom, or nervousness
- **Moving around in your chair**—Signals restlessness
- **Clenching your fist**—Signals hostility or a lack of acceptance
- **Folding your arms tightly high on your chest**—Signals a closed defensiveness, disagreement, discomfort, or withdrawal from a conversation
- **Leaning the side of your head on your hand**—Signals boredom or tiredness
- **Raising your eyebrows**—Signals surprise, doubt, or indifference
- **Scowling or frowning**—Signals disapproval
- **Pressing your lips together tightly**—Signals anger or determination
- **Turning your head from side to side**—Signals disagreement

Exploring Communication Technology

Assignment Sheet 3—Practice Designing an Interference-Free Verbal Message

Name _____ Date _____

Evaluation criteria	Rating
Directions have been followed.	_____
Step-by-step instructions in verbal message are clear, logical, and as interference-free as possible.	_____
Overall rating	_____

Evaluator's comments _____

_____

_____

Introduction

When two people stand face to face in a room and speak to each other, they form a basic communication system including an input, a process, and an output. The input is the message the sender wants to communicate, the process is the words the sender uses to communicate the message, and the output is the message that is actually received by the other person.

Because you function as an element of this type of basic communication system many times every day, you may not be aware of just how difficult it is to eliminate interference from even this basic communication system. Interference can occur during each of the stages in this simple system.

During the input stage, the sender may create a poorly constructed message. By selecting ambiguous words or inaccurate phrases, the sender may construct a message that cannot communicate the idea he or she wishes to send. Therefore, the sender can create interference in the first stage of the communication process.

During the process stage—when the sender actually speaks the message and the sound is carried through the air to the other person—many sources of interference are possible. For example, noise in the room may create enough interference that the words of the sender are actually drowned out.

Even if interference does not occur in the process stage, the receiver can experience two forms of interference at the output stage. The person receiving the message may (1) misinterpret even a well-constructed message or (2) be unable to understand a message that was poorly constructed to begin with.

Assignment Sheet 3

When people stand face to face in the basic communication system described above, they can see each other's facial expressions and ask questions of each other to clarify the sender's message. In doing so, feedback has been added, closing the loop in the communication system and providing the sender with the information he or she needs to know in order to learn how to communicate better.

Interference problems become even more likely to occur when two people try to communicate over a long distance, when high-tech machines are involved in the process stage of the communication system, and when, because of the distances involved, feedback is harder to obtain. In this type of communication system, it becomes critical to eliminate as much interference as possible from the system before the message is communicated. In other words, the message must be well constructed at the input stage—the message must be constructed to be as interference-free as possible.

In Lab Activity Sheet 1, you will simulate satellite communication. You will attempt to communicate long distance with another person. You will use a laser and a receiver in the process stage of this communication system. In the simulation, as would be the case in an actual satellite communication, you will not be allowed immediate feedback with the person receiving and recording the message you send. Therefore, it will be critical that the message you send be as well constructed and as interference free as possible.

In the exercise in this assignment sheet, you will practice eliminating interference from the input stage of the communication system you will use in Lab Activity Sheet 1. You will write a message and then revise it to try to eliminate from it any ambiguous words or inaccurate phrases. Then, you will record this revised message on Student Supplement 3.

Exercise **Write an interference-free message.**

Activity checklist Put a checkmark on the blank line before each activity below as you complete it.

_____ 1. Have your instructor **fill in the space on the next page with an illustration** you will use to write step-by-step duplication instructions.

_____ 2. Study the illustration and then on the blanks provided in Section A on page 26, **write** a message that would give another person **step-by-step instructions** on how to draw the objects in the illustration.

_____ 3. Attempt to complete a drawing that duplicates the illustration by following the steps in the instructions you have written. During this process **revise your message** by eliminating any ambiguous words or inaccurate phrases that might be causing interference in your message. Copy your revised instructions on the blanks provided in Section B on page 27.

Assignment Sheet 3

_____ 4. Read your step-by-step instructions to your instructor so that he or she can attempt to complete a drawing that duplicates the illustration. Then, have your instructor critique your instructions. **Revise your instructions as necessary** following your instructor's critique. Copy your revised instructions on the blanks provided in Section C on page 28.

_____ 5. Re-read and make final revisions to your instructions, and then, **copy the final draft of your step-by-step instructions** on page 29 on Student Supplement 3, "Final Draft of the Step-by-Step Duplication Instructions."

Illustration to be duplicated

Assignment Sheet 3

Section A Rough draft of the step-by-step instructions for duplicating the illustration on page 25

Assignment Sheet 3

Section B First revision of the step-by-step instructions for duplicating the illustration on page 25

Assignment Sheet 3

Section C Second revision of the step-by-step instructions for duplicating the illustration on page 25

Exploring Communication Technology

Student Supplement 3—Final Draft of the Step-by-Step Duplication Instructions

Directions Use the following form to record the final draft of the step-by-step duplication instructions you have revised in Assignment Sheet 3. You will transmit this completed procedure as the message in the simulation activity in Lab Activity Sheet 1, "Simulate Satellite Communication."

Final draft of duplication instructions

Student Supplement 3

Exploring Communication Technology

Assignment Sheet 4—Design a Visual Message

Name _____ Date _____

Evaluation criteria	Rating
Directions have been followed.	_____
Photographs selected in Part A meet the standards of good composition presented in Student Supplement 4.	_____
Descriptions completed in Part A are complete, relevant, and well thought out.	_____
Visual message design created in Part B effectively communicated selected message.	
Overall rating	_____

Evaluator's comments _____

_____

_____

Introduction

As you learned in the information sheet, in photography a camera is used to produce an image on a sensitized surface by the action of radiant energy—light. Therefore, in a sense, photography is a process in which a message is created by light, and as the photographer Yousuf Karsh said, a photograph is a message created using light as its language.

Any language is a system of symbols, or a code. By understanding the code, you can organize the symbols to create a message. The elements of good visual design (or composition) are the code you must understand in order to organize the "language of light" into an effective visual message.

The photograph's meaning or message is created when you use the elements of good visual design and look critically through the camera's viewfinder to select and arrange these elements to create a unified whole—a unified composition.

In this assignment sheet, you will use the elements of good visual design to select and describe five good photographs, and then, you will design a visual message that will use a series of photographs to transmit that message. You will actually take this series of photographs in Lab Activity Sheet 2.

Assignment Sheet 4

Exercise

Part A **Select examples of good photographs.**

Activity checklist Put a checkmark on the blank line before each activity below as you complete it.

_____ 1. **Read** the definition of *visual communication* in **Objective 7** of the information sheet and note the examples listed in that part of the objective.

_____ 2. **Read Student Supplement 4**, "Elements of Visual Design" on page 35.

_____ 3. Look through newspapers, magazines, brochures, newsletters, yearbooks, family photo albums, computerized photo files—various sources of photographs—and **find five** examples of **photographs** that you believe relay an effective message through the skillful use of the elements of visual design, which are presented in Student Supplement 4.

Obtain the actual photographs or computer printouts, or make photocopies of the photographs.

_____ 4. **Write a description** to go with each of the photographs you have selected. In each description, explain the message transmitted by the photograph and how you believe the photographer used the elements of good visual design to transmit that message.

_____ 5. **Turn in your five photographs and five descriptions** to your instructor.

_____ 6. Your instructor will return your photographs and descriptions with suggestions for improvement. **Make the improvements your instructor suggests**, and then, return your photographs and descriptions to your instructor for **final evaluation**.

Part B **Design a series of photographs to transmit a visual message.**

Activity checklist Put a checkmark on the blank before each activity below as you complete it.

_____ 1. **Review Objectives 6, 7, 8, and 9** in the information sheet.

_____ 2. **Review Student Supplement 4**, "Elements of Visual Design."

Assignment Sheet 4

_____ 3. **Design your photographic message:**

On a separate sheet(s) of paper, which you label "Message Design,"

- State the audience for your message.
- State the purpose of your message.
- List the points of information you want the message to contain.
- Plan the initial design of the message—do thumbnail sketches of the various photographs you will use to transmit your message.

Note: Thumbnail sketches are small freehand sketches made quickly to show design ideas.

_____ 4. **Obtain feedback and redesign the message if necessary:**

- Give your instructor your "Message Design" paper with the message descriptions and thumbnail sketches you have made of the various photographs you will use to transmit your message.
- Your instructor will return your "Message Design" paper with the descriptions and thumbnail sketches along with suggestions for improving your message design. Make the improvements your instructor suggests, and then, return your descriptions and sketches to your instructor for final evaluation.

Exploring Communication Technology

Student Supplement 4—Elements of Visual Design

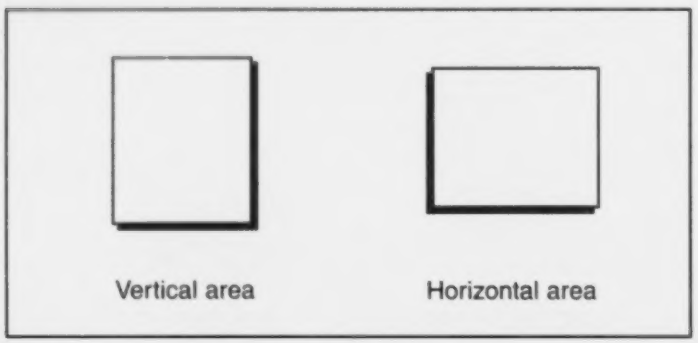
Introduction

Composition is the selection and arrangement of a number of parts to create a unified whole. The following sections discuss each of the elements of visual design that are the "parts" used to create the unified whole in a good photographic composition.

Space

Space is the area that defines a composition. In photography, the borders of a photograph define the space of the composition. When a photographer looks through the viewfinder of the camera, he or she frames the other visual elements of the composition within the vertical and horizontal area defined by the viewfinder's borders, which translates later to the borders of the photograph (see Figure 1). A photographer creates a good photograph by looking through the viewfinder and framing the composition in such a way that the borders actually strengthen the composition of the photograph.

Figure 1



Line

Line in a photograph is the visual element that causes the viewer's eye to move from one point to another within the composition. Line in a photograph may be actual or implied. *Actual line* is created by the actual lines of the objects in the photograph, such as the edges of buildings, stair railings, fences, etc. Actual lines are significant in establishing perspective (the perception of distance within the flat plane of the composition) since they carry a viewer's eye back to create depth. *Implied* means suggested, not real. *Implied lines* are lines suggested by the motion of subjects. For example, our experience with actually seeing boats move across water causes us to "see" an implied direction of movement when we see a photograph of boats on the water.

In a well-composed photograph, line:

- directs the movement of the viewer's eye through the photograph while keeping the eye within the borders of the composition.
- establishes visual emphasis by guiding the viewer's eye to the center of interest (see the section on the center of interest on the next page).

- establishes seeming action or inaction in the composition. Diagonal lines in the composition create movement and action; horizontal lines create static, restful inactivity; and vertical lines create an alive or vigorous action.

Center of interest

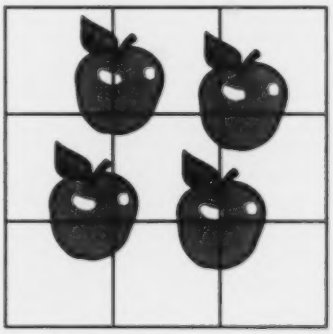
Most photographs picture one person or object (or group of persons or group of objects) that becomes the *center of interest*—that part of the photograph to which the eye of the viewer moves immediately. In a good photograph, the center of interest is the dominate visual element in the composition; all other visual elements in the composition are subordinate.

In maneuvering the viewfinder to make a good photo, the photographer follows three rules concerning the center of interest:

- A photograph should have only one major center of interest.

- The center of interest should not be placed in the exact center of the viewfinder. Central placement of the center of interest often creates a composition that seems dull and static. To avoid a static composition, photographers often use the *rule of thirds*—they mentally divide the area in the viewfinder into thirds with imaginary vertical and horizontal lines, and place the center of interest at or near one of the four points where the imaginary division lines cross (see Figure 2).

Figure 2



Place center of interest at one of the points where the lines cross, not in the exact center.

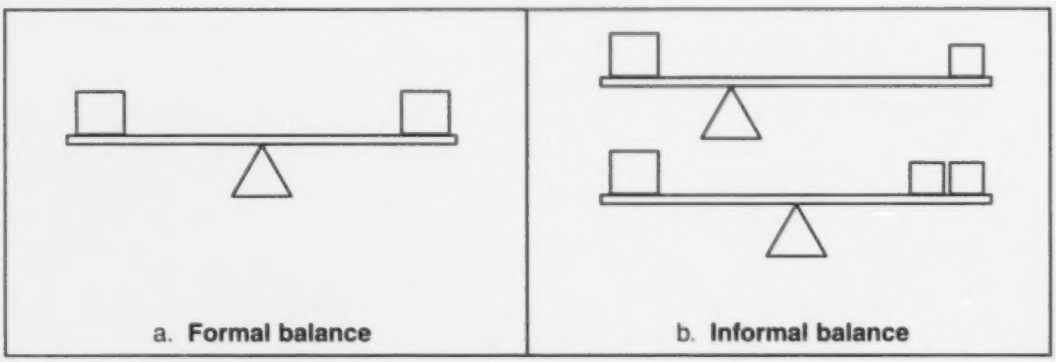
- The center of interest should not be placed too close to one of the borders. Placement along a border creates a composition that seems out of balance (see the section on balance on the next page). Again, using the *rule of thirds* when looking through the viewfinder helps the photographer create a balanced center of interest that is not too close to one of the borders.

Student Supplement 4

Balance

When we look at a photograph, the mind assigns "weight" to each of the image masses and lines in the composition. To be pleasing to the viewer, these weights must appear balanced in the composition. *Balanced* compositions, however, are not balanced in the symmetrical, *formal,* mathematical sense in which two weights of the same size and shape are placed at equal distances on each side of a central point (see Figure 3-a); this type of visual balance makes a composition seem static to the viewer's eye. The type of balance that is pleasing to the viewer's eye is called *informal balance.* Informal balance is asymmetrical—not symmetrical—balance achieved by only seeming to equalize the weight of the image masses or lines. For example, a small image mass placed farther away from the central point seems to balance a larger image mass placed closer to the central point (see Figure 3-b). Or, two small image masses seem to balance a larger image mass on the opposite side of the central point (see Figure 3-b).

Figure 3



a. **Formal balance** b. **Informal balance**

Rhythm

Lines or masses of similar or equal size, shape, or direction seem to create a pattern within the visual field of the photograph; such a pattern is called *rhythm.* However, just as formal balance in a composition often seems static to the viewer's eye, a single repeated pattern (rhythm) in a photograph often seems monotonous to the viewer's eye. When looking through the viewfinder to create a good composition, the photographer should try to create rhythm within the borders of the composition, but not monotonous rhythm. The most pleasing type of rhythm is an interrupted rhythm. For example, two patterns that oppose each other are pleasing because they seem to build tension and interest.

Contrast

Contrast is defined as the juxtaposition of dissimilar elements. When a photographer talks about contrast, one of the elements he or she may refer to is the contrast of sharpness juxtaposed with unsharpness in a composition, where the object he or she focuses on with the viewfinder of the camera appears sharp (in focus) and objects behind appear to be hazy (out of focus). A good photographer uses this contrast of sharpness to create the illusion of depth in a composition and to emphasize the object focused on by reducing any distraction that would be caused by sharp details in the background. Photographers often call this technique *depth of field.*

Exploring Communication Technology

Assignment Sheet 5—Practice Designing an Interference-Free Coded Message

Name _____ Date _____

Evaluation criteria	Rating
Directions have been followed.	_____
Twenty-word description created in Part A is clear and as interference free as possible.	_____
Code key created in Part B is logical and easy to use.	_____
Coded message created in Part C is clear and as interference free as possible.	
Overall rating	_____

Evaluator's comments _____

_____

_____

Introduction

As you learned in the information sheet, messages are transmitted on fiber-optic cables made of thin, transparent fibers of glass or plastic. In Lab Activity Sheet 3, you will simulate fiber-optic communication—you will attempt to send a coded message that will use light in the process stage of the communication system.

It will be critical that the coded message you send be as well constructed and as interference free as possible. In the exercise in this assignment, you will practice eliminating interference from the input stage of the communication system you will use in Lab Activity Sheet 3. You will write a message that describes something in your classroom or laboratory, create a code key, and then create your coded message, trying at each stage to eliminate as much interference as possible. Then, you will record the final draft of these revisions on Student Supplement 5.

Exercise

Part A **Write an interference-free message.**

Activity checklist Put a checkmark on the blank line before each activity below as you complete it.

_____ 1. On the blank lines provided in Section 1 on page 40, **write a rough draft** of a message that describes something in your classroom or laboratory. Your message must be at least 20 words long.

ASSIGNMENT SHEET 5

Assignment Sheet 5

_____ 2. **Revise your message** by eliminating any ambiguous words or inaccurate phrases that might be causing interference in your message. Copy your revised message on the blanks provided in Section 2 on page 41.

_____ 3. Show the message you have written and revised to your instructor and have him or her critique the message. **Revise your message** as necessary following your instructor's critique. Copy the final draft of your 20-word description on page 47 on Part A of Student Supplement 5, "Final Drafts of Your Description, Code Key, and Coded Message."

Section 1 **Rough draft of your 20-word description**

Assignment Sheet 5

Section 2 **Revision of your 20-word description**

Assignment Sheet 5

Part B **Create a code key.**

Activity checklist Put a checkmark on the blank line before each activity below as you complete it.

_____ 1. **Read Lab Activity 3**, which begins on page 77, and become familiar with the procedure you will complete in the activity.

_____ 2. **Create a logical code** that will be easy to use with the fiber-optic simulator that will transmit your 20-word description. In the space provided in Section 1 below, create and record the key for the code you will use.

_____ 3. **Revise your code key** to eliminate anything that might cause interference. Copy your revised code key in the blank space provided in Section 2 on page 43.

_____ 4. Show your code key to your instructor and have him or her critique your code. **Revise your code key** as necessary following your instructor's critique. Copy the final draft of your code key on page 48 on Part B of Student Supplement 5.

Section 1 **Rough draft of your code key**

Assignment Sheet 5

Section 2 Revision of your code key

Assignment Sheet 5

Part C **Create your coded message.**

Activity checklist Put a checkmark on the blank line before each activity below as you complete it.

_____ 1. Using the 20-word message that you completed in Part A and the code key you completed in Part B, **create a coded message** that you will use in completing Lab Activity Sheet 3. Copy your coded message in the space provided in Section 1 below.

_____ 2. **Revise your coded message** to eliminate anything that might cause interference in your coded message. Copy your revised coded message in the blank space provided in Section 2 on page 45.

_____ 3. Show your coded message to your instructor and have him or her critique your coded message. **Revise your coded message** as necessary following your instructor's critique. Copy the final draft of your coded message on page 49 on Part C of Student Supplement 5.

Section 1 **Rough draft of your coded message**

Assignment Sheet 5

Section 2 Revision of your coded message

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Exploring Communication Technology

Student Supplement 5—Final Drafts of Your Description, Code Key, and Coded Message

Part A **Final draft of your 20-word description**

Directions Use the blank lines below to record the final draft of the 20-word description you have revised in Assignment Sheet 5. You will transmit this description as the message in the simulation activity in Lab Activity Sheet 3, "Simulate Fiber-Optic Communication."

Student Supplement 5

Part B **Final draft of your code key**

Directions Use the space below to record the final draft of the code key you have revised in Assignment Sheet 5. You will use this code key to code the message you copied in Part A of this student supplement.

Student Supplement 5

Part C **Final draft of your coded message**

Directions Use the space below to record the final draft of the coded message you have revised in Assignment Sheet 5. You will transmit this coded message in the simulation activity in Lab Activity Sheet 3, "Simulate Fiber-Optic Communication."

Exploring Communication Technology

Assignment Sheet 6—Design an Audiovisual Message

Name _____ Date _____

Evaluation criteria	Rating
Directions have been followed.	_____
Script is clear, logical, and as interference free as possible.	_____
Storyboard is clear, logical, and as interference free as possible.	_____
Overall rating	_____

Evaluator's comments _____

_____

_____

Introduction

Since the invention and widespread use of commercial television, audiovisual messages have been a staple of commercial communications. As you learned in the information sheet, television production is a complex audiovisual communication system that uses cameras, microphones, monitors, controls, and computers to record and transmit both audio and video messages simultaneously. Now, however, thanks to VCR (videocassette recorder) technology, audiovisual messages can be recorded relatively easily and inexpensively—and many of you probably have had experiences using this technology at home.

In Lab Activity Sheet 4, you will produce and transmit an audiovisual message using a VCR system. However, like any of the other messages you have recorded and transmitted in this unit, VCR audiovisual messages also have to be planned and refined before the tape starts to roll. Scripts and storyboards are used to plan audiovisual messages. In this assignment sheet, you will learn the basics of planning the scripts and storyboards used to make audiovisual productions as interference free as possible.

Exercise

Activity checklist

Put a checkmark on the blank line before each activity below as you complete it.

_____ 1. **Read Student Supplement 6**, "The Basics of Audiovisual Planning and Production," on page 53.

_____ 2. Your instructor will divide your class into groups with at least five students per group. Meet with your assigned group and **select a product or service to be promoted** in your group's 30-second audiovisual message.

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Assignment Sheet 6

_____ 3. **Have your instructor approve** the product or service your group has selected.

_____ 4. **Decide on the duties of each group member**. You will need to assign a director, script writer, storyboard artist, production crew (camera person, sound person), post-production crew (camera person, sound person), and performers (actors/actresses, narrator) as appropriate.

_____ 5. **Have your instructor approve** your group assignments.

_____ 6. On a separate sheet(s) of paper, write a **rough draft of the script**. Label this paper "Script Rough Draft."

_____ 7. On a separate sheet(s) of paper, **revise the script** to make your message as interference free as possible. Label this paper "Script Revision."

_____ 8. **Turn in your revised script** to your instructor.

_____ 9. Your instructor will return your script to your group with suggestions for improvement. **Make the improvements** your instructor suggests, and then, **return your script** to your instructor **for final evaluation**.

_____ 10. On a separate sheet(s) of paper, **prepare the rough draft of the storyboard**. Label this paper "Storyboard Rough Draft."

_____ 11. On a separate sheet(s) of paper, **revise the storyboard** to make your message as interference free as possible. Label this paper "Storyboard Revision."

_____ 12. **Turn in your revised storyboard** to your instructor.

_____ 13. Your instructor will return your storyboard to your group with suggestions for improvement. **Make the improvements** your instructor suggests, and then, **return your storyboard** to your instructor **for final evaluation**.

Exploring Communication Technology

Student Supplement 6—The Basics of Audiovisual Planning and Production

Steps in developing audiovisual messages

Pre-production steps

1. Outline the message to be delivered.
2. Write a rough draft of the script.
3. Finalize the script.
4. Prepare a rough draft of the storyboard.
5. Finalize the storyboard.
6. Select the people that will be needed to produce the message: writer, director, performers (actors, actresses, narrator), production crew, etc.
7. Obtain the production equipment required.
8. Determine the location site.
9. Make or obtain the props, costumes, and scenery.
10. Rehearse the performers and production crew.

Production steps

1. Shoot the videotapes on location.
2. Shoot any additional videotapes required in the production studio.

Post-production steps

1. Record the narration, music, and special effects as needed and mix.

   Note: If your studio does not have mixing capabilities, you will need to record these additional audio portions during the production stage.

2. Complete the final production.
3. Show the final production to an audience.
4. Obtain feedback from the audience on the following points:

   - Message content is effective and in good taste
   - Sound is of good quality and is used effectively
   - Video portion is of good quality and is effectively presented
   - The overall production is perceived as being of good quality

5. Edit the audiovisual message as required after receiving feedback.

Student Supplement 6

Developing production scripts

Production scripts are very complete, with all the narration written word for word as well as all the production techniques noted (see Figure 1). The following guidelines should be used for developing a complete production script.

- Stay with one central idea.
- Do not clutter the message with unnecessary information.
- Keep the ideas simple.
- Use good taste in your message.
- Note all dialog, sound effects (SE), and music in the script.
- Note all scenery, costumes, and props.
- Note all camera distances and angles (see the section on basic camera shots that follows), techniques for transitioning from one scene to another, and all lighting details.

Figure 1: Audiovisual script

Frame	Time (sec)	Visual	Narration/SE
1	5	Two female teenagers (Jennifer and Tracy) sitting on bed talking to each other. MS of both girls, then CU of Jennifer.	**Jennifer:** Oh, Tracy, I love your sweater. Where did you get it?
2	12	CU of Tracy	**Tracy:** Thanks, Jennifer. I got it at the new store across from school. It's called the "Teen Shoppe," and it just has everything! And the prices are great, too.
3	5	CU of Jennifer	**Jennifer:** Let's go there tomorrow and shop. I'd love to see what they have.
4	8	CU of Teen Shoppe shopping bag with logo.	**VO Announcer:** Visit the "Teen Shoppe" for the latest fashions at four-thirty-three South Main in Brookville.

Student Supplement 6

Developing a storyboard

A storyboard is an arrangement of storycards with each storycard representing one camera shot (see Figure 2). A storyboard is developed to test the effectiveness of the flow of events in the audiovisual message before the message is filmed. Developing a storyboard allows for individual shots to be reviewed, revised, and rearranged or eliminated—planned inexpensively before the much more expensive process of shooting the audiovisual message. Use the following guidelines in creating the storyboard you will use in your audiovisual message.

- Storycards are usually made on large index cards.
- Each storycard should contain all the information required for one frame (shot).
- Each storycard should contain the following information in the following format (see Figure 2).
  - — Frame (shot) number; placed in the upper-right corner of the card
  - — Sketch of what the frame (shot) will show; placed in the upper-left portion of the card
  - — Summary of the dialog and action to take place in this frame (shot); placed across the bottom of the card
  - — Summary of the production techniques to be used in the frame (called *production notes*); placed below the frame number on the right side of the card

Figure 2: Storyboard

Student Supplement 6

Basic camera shots

Distance of shot

- **Long shot** (LC)—A shot that provides a view of the subject within a general setting (see Figure 3-a)
- **Medium shot** (MS)—A shot that provides a close view of the subject and eliminates unnecessary background in the setting (see Figure 3-b)
- **Close-up shot** (CU)—A shot that provides a concentrated view of the subject and eliminates much of the background in the setting (see Figure 3-c)

  Example: A close-up shot that just concentrates on the face of a person.

Figure 3: Distance of shot

a. **Long shot**

b. **Medium shot**

c. **Close-up shot**

Student Supplement 6

Angle of shot

- **High-angle shot**—A shot taken from above the subject (see Figure 4-a)

  Note: A high-angle shot makes the subject appear smaller.

- **Low-angle shot**—A shot taken from below the subject (see Figure 4-b)

  Note: A low-angle shot makes the subject appear larger.

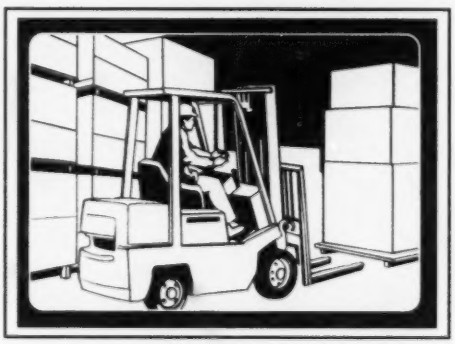
- **Straight-on shot**—A shot of the subject taken from the eye level of the camera person (see Figure 4-c)

  Note: A straight-on shot is also called a *normal-camera-position shot* since most shots are taken from this position.

Figure 4: Angle of shot

a. **High-angle shot**

b. **Low-angle shot**



c. **Straight-on shot**
(normal shot)

Student Supplement 6

Audiovisual production terminology

- **Background** (BG)—Props and scenery placed behind the performers; also any supporting music or sound effects.
- **Boom mike**—A microphone suspended from a long, movable arm attached to a stand that is placed off screen

  Note: A boom mike is used to follow performers when they move but still remain out of the sight of the camera.
- **Cue**—A signal given to begin a scene; the last words of dialog a preceding performer speaks, which become the signal that lets another performer know his or her dialog is next
- **Cut**—To switch abruptly from one scene to another
- **Dissolve**—To merge two scenes by fading one scene out while the other scene gradually appears
- **Pan**—To move the camera horizontally (side to side) across a scene
- **Shot**—The picture taken by a camera
- **Sound effects** (SE)—Effects that imitate sounds called for in a script and are produced by various means

  Examples: Slamming door, wind, creaking stairs, footsteps
- **Tilt**—To move the camera vertically (up and down) across a scene
- **Voice over** (VO)—Dialog spoken by a speaker who is not visible on the screen
- **Zoom in**—To move the camera toward the subject
- **Zoom out**—To move the camera away from the subject

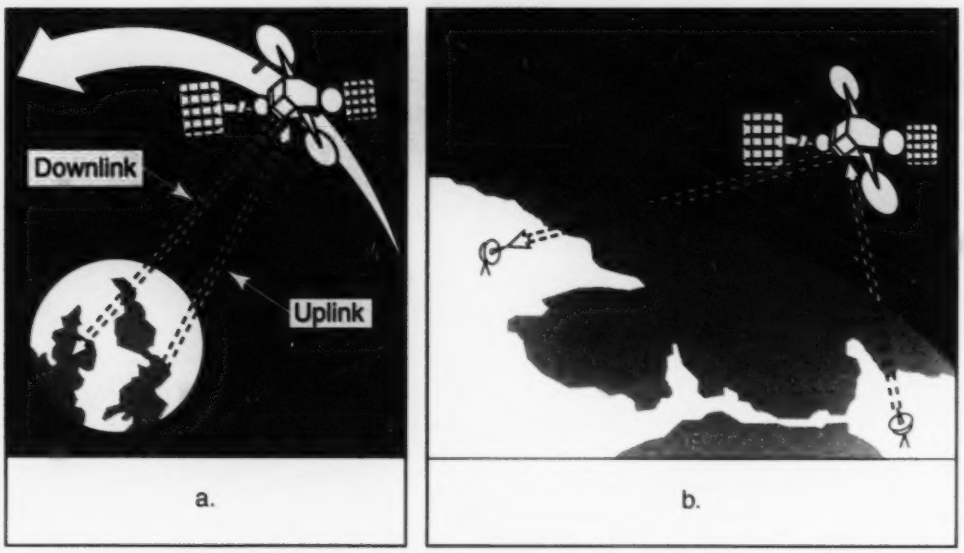
Exploring Communication Technology

Lab Activity Sheet 1—Simulate Satellite Communication

Introduction

A communication satellite is really a radio relay station in geostationary (**geo** means *earth* and **stationary** means *fixed*) orbit over the Earth (see Figure 1-a). Radio signals are sent (transmitted) to an orbiting satellite from an earth station, a large, pie-shaped antenna. This upward transmission is called an *uplink*. The satellite receives the signal and re-transmits it back to Earth. This downward transmission is called a *downlink*. A receiving earth station captures the signal (see Figure 1-b).

Figure 1



A satellite transmits the signal back to Earth at an angle much the same way that a beam of light can be reflected by a mirror. In this lab activity sheet, you will use the beam of light created by a laser and a mirror to simulate a satellite communication system.

Principle of sound transmission

The same scientific principle applies to sound transmission carried by either radio waves or light waves: ***Messages can be carried as signals on a vibrating band of energy.*** Both lasers and radio transmitters produce vibrating bands of energy that can be modified to transmit sound.

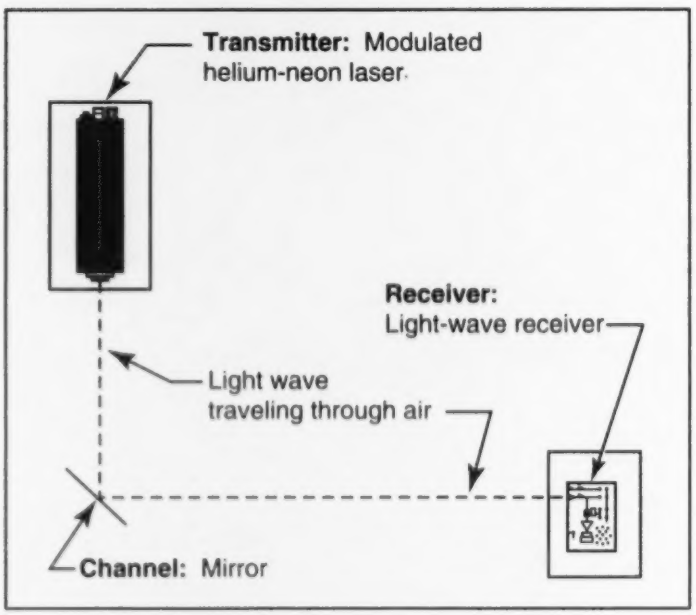
When you speak into a microphone, sound waves of various intensity hit the microphone. Electrical circuitry in the microphone produces a varying electrical signal in response to the vibrations in the sound waves hitting the microphone. This varying electrical signal is then amplified (made stronger) and then modulated (superimposed on the wave length of the original energy band produced by the radio or laser), which creates variations in the energy band.

Lab Activity Sheet 1

In satellite communication, the amplified electrical signal is modulated with a radio carrier wave and transmitted through the atmosphere, where it is picked up by a satellite and re-transmitted at an angle back to a receiver on Earth. The circuitry in the receiver demodulates (separates the carrier wave from the signal) and amplifies the signal before sending it to the speaker, where you hear the transmitted message.

In the laser simulation, the amplified electrical signal is modulated with a carrier wave of light and transmitted through the air to a mirror that reflects the light beam at an angle to a receiver containing a photodiode. The photodiode collects the light beam and circuitry associated with the receiver demodulates and amplifies the signal before sending it to the speaker, where you hear the transmitted message (see Figure 2).

Figure 2



Laser safety

You will use a helium-neon laser to produce the carrier wave in the simulation activity. As with any other piece of equipment, you should (1) learn the parts of the equipment and (2) learn the safety rules to be followed during use of the equipment.

Your instructor will show you the parts of the laser and receiver used in your laboratory and will demonstrate the proper use. Safety rules to be followed during use of the laser are given on the next page.

Lab Activity Sheet 1

Helium-neon lasers emit a low-powered energy beam of red light. This light contains no harmful radiation, and you should not confuse it with the light emitted by the powerful lasers used for burning, cutting, or drilling steel or other metals. However, even though the light beam emitted from this type of laser is relatively low powered, it is intense and concentrated and may cause damage to your eyes should they be exposed to the beam for a period of time. Therefore, you must be careful to follow certain eye-safety rules when using the laser.

- Do **not** look directly into the laser beam or stare at its bright reflection, just as you should not stare at the sun or any other very bright light source.
- If the beam is to travel a long distance, keep it close to the ground or overhead so that it does not cross a walkway at eye level. This measure protects the eyes of a person who might accidentally walk through the light beam.
- When the laser is powered but is not being used for transmission, block the laser by sliding the open/close clip into the CLOSE position.
- Always warn others before unblocking the laser (sliding the open/close clip into the OPEN position).

Helium-neon lasers generate high voltages similar to those inside a television receiver, and capacitors within the power supply retain potentially harmful voltages for a period of time even after the power has been turned off. To prevent electrical accidents when using the laser, practice the following electrical-safety rules.

- Each laser is equipped with a UL-approved power cord and a three-prong grounded plug. Always plug the laser into a grounded outlet.
- The laser housing is sealed to protect the user and to comply with federal laser-safety legislation. Do **not** open the laser housing for any reason.

Troubleshooting laser sound-transmission problems

When you set up the components of the simulation activity correctly, you will be able to transmit sound. However, in the laser communication system—as in any other communication system—interference can occur. If you are unable to transmit sound with the laser, check the following list for possible sources of interference.

1. Is the laser powered (the power cord plugged into a proper outlet)?
2. Is the power switch on the laser turned to the ON position?
3. Is the microphone powered (plugged into the laser microphone jack)?
4. Is the microphone switch turned to the ON position?
5. Is the power switch on the receiver turned to the ON position?

Lab Activity Sheet 1

6. Is the laser beam aimed directly into the proper photodiode on the receiver?

7. If using a battery-powered receiver, is the battery dead or low in power?

8. Is the audio switch on the receiver turned to the ON position?

9. Are you speaking softly into the microphone during transmission? If the volume of the sound being fed into the microphone is too strong, excessive modulation will occur, causing the laser to "blink." Speak softly to prevent this type of interference.

Equipment and materials

Your instructor will provide you with the following materials:

- Hard-seal modulated helium-neon laser and manufacturer's instruction manual
- Microphone supplied with laser
- 3-inch focal-length lenses supplied with laser
- Light-wave receiver
- Movable, adjustable stand and strapping mechanism for laser
- Movable stand and strapping mechanism for receiver
- Mirror (flat, silvered glass, 100 mm x 100 mm)
- Ring stand to hold mirror
- Classmate to serve as an assistant

You will also need the following Student Supplement:

- Student Supplement 3, "Final Draft of the Step-by-Step Duplication Instructions."

Procedure

Put a checkmark on the blank line before each step below as you complete it.

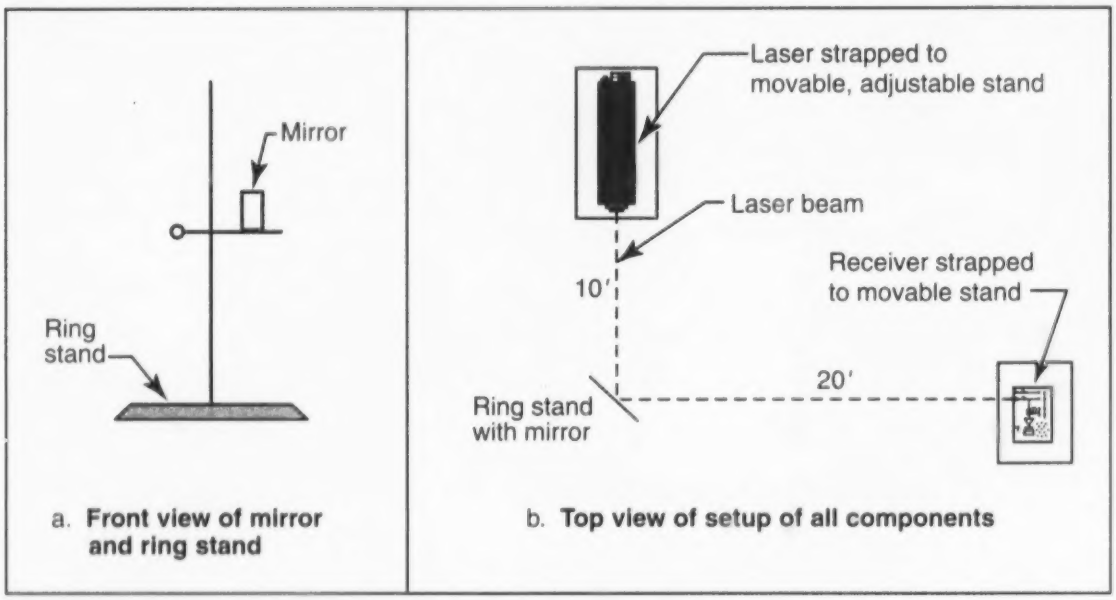
_____ 1. Place the laser on the movable, adjustable stand and strap the laser firmly in place.

_____ 2. Follow the manufacturer's instructions for installing the 3-inch focal-length lenses on the laser.

_____ 3. Place the receiver on the movable stand and strap the receiver firmly in place.

_____ 4. Place the laser stand, receiver stand, and mirror on the ring stand as shown in the diagram in Figure 3.

Figure 3



a. **Front view of mirror and ring stand**

b. **Top view of setup of all components**

_____ 5. Check to be sure that the laser is blocked (open/close clip is in the CLOSE position); block the laser *if* necessary.

_____ 6. Plug the laser power cord into a properly grounded power outlet.

_____ 7. Review the worksheet that follows on page 69. Have your instructor verify that the laser has been set up correctly by signing the signature line in Part A on the worksheet.

_____ 8. Turn the laser power switch to the ON position.

_____ 9. Have your assistant turn the receiver power switch to the ON position.

_____ 10. Level the laser:

- Warn your assistant and any others nearby that you are going to unblock the laser.
- Unblock the laser (slide the open/close clip to the OPEN position).

Caution: Do not look directly into the laser beam.

- Following your assistant's directions, adjust the laser-stand height as necessary to align (level) the laser beam with the photodiode in the receiver (see Figure 3-b).

Lab Activity Sheet 1

_____ 11. When your assistant indicates that the laser beam is level with the receiver photodiode, block the laser beam.

_____ 12. Plug the microphone into the laser microphone jack and then turn the microphone power switch to the ON position.

_____ 13. Instruct your assistant to turn the receiver audio switch to the ON position.

_____ 14. Instruct your assistant to prepare to receive and record the message.

_____ 15. Warn others that you are going to unblock the laser.

_____ 16. Unblock the laser.

Caution: Do not look directly into the laser beam.

_____ 17. Read the message you recorded on Student Supplement 3, speaking softly into the microphone.

Note: If the volume of the sound being fed into the microphone is too strong, excessive modulation will cause the laser to "blink." Speak softly to prevent this type of interference.

_____ 18. Have your assistant record the message on the "Message Record Form" in Part B on page 70 on the worksheet.

_____ 19. Block the laser.

_____ 20. Retrieve Part B of the worksheet from your assistant and compare the message you recorded on Student Supplement 3 to the message your assistant recorded on Part B of the worksheet.

_____ 21. *If* your assistant was unable to record the message successfully, determine the source of the interference and record the interference source on the "Interference Record Form" in Part C on page 71 on the worksheet.

Note: If the interference seems to result from noise in the transmission process, determine the source by going through the checklist presented in the introduction to this lab activity sheet. If the interference seems to result from the construction of the message sent, determine the source by checking for ambiguous words or inaccurate phrases.

_____ 22. Correct the source of interference and repeat Steps 11 through 21 as necessary until the message is successfully transmitted and recorded.

Lab Activity Sheet 1

_____ 23. Have your assistant turn the receiver audio switch and power switch to the OFF position.

_____ 24. Unplug the microphone from the laser, turn the laser power switch to the OFF position, and unplug the laser from the power outlet.

_____ 25. Return equipment and materials to proper storage. Your instructor will rate your performance on Part D on page 72 on the worksheet.

Lab Activity Sheet 1

Worksheet—Simulate Satellite Communication

Name _____ Date _____

Part A: Pre-performance check

- Instructor's signature below verifies that the laser has been set up correctly and safely and the student may proceed with the simulation activity using the laser.

Instructor's signature _____

Lab Activity Sheet 1

Worksheet—Simulate Satellite Communication

Part B: Message record form

Directions: Make several copies of this page to be used by your assistant. Your assistant will use a copy of this page each time it is necessary to re-transmit and re-record the message. Write the number of each attempt on the blank provided.

Attempt number _____

Message recorded _____

Lab Activity Sheet 1

Worksheet—Simulate Satellite Communication

Part C: Interference record form

Directions: Make several copies of this page to be used by you in recording source(s) of interference. You will use a copy of this page each time it is necessary to re-transmit and re-record the message. Write the number of each transmission attempt on the blank provided.

Attempt number _____

Source(s) of interference _____

Lab Activity Sheet 1

Worksheet—Simulate Satellite Communication

Part D: Performance evaluation

Evaluation criteria	Rating
Procedure was completed correctly and accurately.	_____
Message was successfully transmitted and recorded.	_____
Safety precautions were observed.	_____
Clean-up and follow-up actions were adequate.	_____
Overall rating	_____

Evaluator's comments _____

_____

_____

Exploring Communication Technology

Lab Activity Sheet 2—Take a Series of Photographs

Introduction

In Objective 10 of the information sheet, you learned that, in photography, a camera is used to produce an image on a sensitized surface by the action of radiant energy (light), and in Assignment Sheet 4, "Design a Visual Message," you created a design for transmitting a message by using a series of photographs. In Student Supplement 4, "Elements of Visual Design," you studied the techniques that photographers use to create good photographic messages. In this lab activity sheet, you will go out and use a camera to create the series of photographs that will comprise the visual message you have designed. Read the guidelines below for completing the procedure called for in this lab activity sheet, and then, complete the procedure steps also presented below.

Guidelines for caring for a camera

Cameras—whether they are the traditional cameras that use film or the new digital cameras—are expensive, complicated, and very delicate instruments, and even minor problems caused from mishandling them can be costly to repair. Follow the guidelines below to learn how to properly handle a camera.

- Read the manufacturer's instruction manual to learn the specific care and use instructions for the camera.
- Store and carry the camera in its protective case to help protect it from damage.
- When the camera is stored in its protective case, be sure the lens cap is attached to protect the lens from dirt and dust.
- Remove any dust that does get on a camera lens by gently blowing on the lens or brushing it with a special lens brush. Remove fingerprints or smears with lens-cleaning tissue—**not** eyeglass tissue.
- Keep the camera away from moisture.
- Do **not** subject a camera to extreme temperatures (temperatures that are too hot or too cold).

Guidelines for taking photographs

- To prevent blurred pictures, hold the camera steady and level, or use a tripod.
- Keep your fingers or other obstructions such as the camera strap from getting in front of the camera lens.
- Press the shutter release smoothly; don't jab it. Jabbing the shutter release causes the camera to move, resulting in blurred pictures.
- Center your eye in the viewfinder to compose your picture.

Lab Activity Sheet 2

- Frame the center of interest in the viewfinder for proper composition (see Student Supplement 4), and then, check the framed area for mergers (distractions in the background).

Equipment and materials

Your instructor will provide you with the following materials:

- one camera
- one tripod
- manufacturer's instructions for care and use of the camera

Procedure

Put a checkmark on the blank line before each step below as you complete it.

_____ 1. Review the following worksheet associated with this lab activity.

_____ 2. Complete the pre-performance check (Part A) on page 75 on the worksheet and receive your instructor's signed approval for the information you have listed for performing the procedure.

_____ 3. Review the evaluation criteria listed in the performance evaluation (Part B) on page 76 on the worksheet.

_____ 4. Produce the visual message:

- Take the series of photographs you have sketched in the message design you completed in Assignment Sheet 4.
- Process the photographs according to your instructor's directions.

  Note: Your instructor may have you process photographs in a photo lab in your classroom or printed from a computer setup if using a digital camera, or he or she may have your photographs sent off to a photo lab for processing.

- Turn in your series of photographs to your instructor along with your message and message design, which you completed in Assignment Sheet 4.
- Your instructor will return your photograph series with suggestions for improvement. Make the improvements your instructor suggests, and then, return your revised photographs to your instructor for final evaluation.

_____ 5. Return equipment and materials to proper storage. Your instructor will rate your performance using the evaluation criteria listed in Part B on the worksheet.

Lab Activity Sheet 2

Worksheet—Take a Series of Photographs

Name _____ Date _____

Part A: Pre-performance check

Complete the following information concerning the camera you will be using to take this series of photographs, and then, have your instructor sign on the blank line at the bottom of this page.

- List the make and model of the camera you will be using to take your series of photographs.
- Read the manufacturer's instructions for proper care and use of this camera, and write a summary of these instructions on a separate piece(s) of paper.
- Describe the camera setup you will use to photograph the series of photographs you will be taking for your message (type of film, camera setting, type of lighting you will be using—back lighting, front lighting, side lighting, inside lighting, natural lighting—etc.) Write your description in the space provided below or on a separate piece(s) of paper.

Instructor's signature _____

Lab Activity Sheet 2

Worksheet—Take a Series of Photographs

Part B: Performance evaluation

Evaluation criteria	**Rating**
Photographs meet the standards for good composition listed in Student Supplement 4.	_____
Photographs effectively transmit the message designed in Assignment Sheet 4.	_____
Camera was handled according to the guidelines presented in the introduction to this lab activity sheet.	_____
Clean-up and follow-up actions were adequate.	_____
Overall rating	_____

Evaluator's comments _____

_____

_____

Exploring Communication Technology

Lab Activity Sheet 3—Simulate Fiber-Optic Communication

Introduction

In Objective 12 of the information sheet, you learned that fiber optics is one of the emerging communication-transmission technologies, and in Assignment Sheet 5, you practiced designing an interference-free coded message. In this lab activity sheet, you will use the coded message you designed in Assignment Sheet 5 to simulate fiber-optic communication.

Principle of transmission

As you studied in the information sheet, messages are transmitted on fiber-optic cables made of thin, transparent fibers of glass or plastic. Messages are converted to light, and the light is transmitted by internal reflection in the glass or plastic fibers of the cable. In this lab activity, you will use a clear acrylic rod and the light from a flashlight to simulate transmitting light on fiber-optic cables.

Equipment and materials

Your instructor will provide you with the following materials:

- one clear-cast acrylic rod (¼-inch diameter)
- one piece of ¾-inch particle board or other scrap wood
- fine-grade sand cloth
- a roll of electrical tape
- ordinary two-cell flashlight
- measuring device

You will also need approval to use the following lab equipment and the appropriate safety equipment (safety glasses or goggles, for example) required for use with this equipment:

- Drill press
- Bandsaw

You will also need the following student supplement:

- Student Supplement 5, with the final draft of your message, the code key, and your coded message.

Procedure

Put a checkmark on the blank line before each step below as you complete it.

_____ 1. Use the bandsaw to cut the acrylic rod to a 12-inch length and to cut the wood into a 2 x 2-inch square.

_____ 2. Use the drill press to drill a ¼-inch diameter hole in the center of the wood square.

_____ 3. Use the sand cloth to polish the ends of the acrylic rod until they are transparent.

Lab Activity Sheet 3

_____ 4. Use electrical tape to attach the flashlight to the wood square so that the lens of the flashlight is centered over the hole in the center of the wood square.

_____ 5. Place one end of the polished acrylic rod into the hole on the other side of the wood square.

_____ 6. Test the transmitter: Turn the flashlight on and off to make sure you can see the light from the flashlight coming through the acrylic rod.

_____ 7. Review the worksheet that follows on page 79. Have your instructor verify that the simulator has been set up correctly by signing the signature line on Part A of the worksheet.

_____ 8. Instruct your assistant to prepare to receive and record the coded message.

_____ 9. Send the coded message you have recorded on Student Supplement 5.

_____ 10. Have your assistant record the message on the "Message Record Form" in Part B on page 80 on the worksheet.

_____ 11. Retrieve Part B of the worksheet from your assistant and compare the message recorded on Student Supplement 5 to the message your assistant recorded on Part B of the worksheet.

_____ 12. If your assistant was unable to record the message successfully, determine the source of the interference and record the interference source on the "Interference Record Form" in Part C on page 81 of the worksheet.

Note: If the interference seems to result from noise in the transmission process, determine the source of noise in your transmitting equipment. If the interference seems to result from the construction of the coded message, determine the source of noise in the message.

_____ 13. Correct the source of interference and repeat Steps 9 through 12 as necessary until the message is successfully transmitted and recorded.

_____ 14. Return equipment and materials to proper storage. Your instructor will rate your performance on Part D on page 82 of the worksheet.

Lab Activity Sheet 3

Worksheet—Simulate Fiber-Optic Communication

Name _____ Date _____

Part A: Pre-performance check

- Instructor's signature below verifies that the fiber-optic simulator has been set up correctly and the student may proceed with the simulation activity.

Instructor's signature _____

Lab Activity Sheet 3

Worksheet—Simulate Fiber-Optic Communication

Part B: Message record form

Directions: Make several copies of this page to be used by your assistant. Your assistant will use a copy of this page each time it is necessary to re-transmit and re-record the message. Write the number of each attempt on the blank provided.

Attempt number _____

Message recorded _____

Lab Activity Sheet 3

Worksheet—Simulate Fiber-Optic Communication

Part C: Interference record form

Directions: Make several copies of this page to be used by you in recording source(s) of interference. You will use a copy of this page each time it is necessary to re-transmit and re-record the message. Write the number of each transmission attempt on the blank provided.

Attempt number _____

Source(s) of interference _____

Lab Activity Sheet 3

Worksheet—Simulate Fiber-Optic Communication

Part D: Performance evaluation

Evaluation criteria	**Rating**
Procedure was completed correctly and accurately.	_____
Message was successfully transmitted and recorded.	_____
Safety precautions were observed.	_____
Clean-up and follow-up actions were adequate.	_____
Overall rating	_____

Evaluator's comments _____

_____

_____

Exploring Communication Technology

Lab Activity Sheet 4—Produce and Transmit an Audiovisual Message

Introduction

In Assignment Sheet 6, your group created a script and a storyboard for a 30-second audiovisual presentation. In this lab activity sheet, your group will actually produce and transmit the audiovisual message you have designed.

Most audiovisual messages are recorded on magnetic tape and then reproduced on other tapes, compact discs, or video discs. In this lab activity, you will use VCR technology to produce and transmit your audiovisual message.

Equipment and materials

Your instructor will provide you with the following materials:

- VCR recording equipment and tape
- Manufacturer's instruction manual for the recording equipment you will be using
- Tape-editing equipment
- Manufacturer's instruction manual for the tape-editing equipment
- Television/VCR for transmitting your completed message

You will also need the following student supplement:

- Student Supplement 6, "The Basics of Audiovisual Planning and Production," which lists the pre-production, production, and post-production steps for producing your audiovisual message.

Procedure

Put a checkmark on the blank line before each step below as you complete it.

_____ 1. Read the manufacturer's instruction manual to learn the specific care and use instructions for the VCR recording equipment your group will be using.

_____ 2. Read Student Supplement 6.

_____ 3. Review the worksheet that follows on page 85.

_____ 4. Complete the pre-performance check (Part A) on the worksheet and receive your instructor's signed approval for the information you have listed for performing the procedure.

_____ 5. Review the evaluation criteria listed in the performance evaluation (Part C) on page 87 on the worksheet.

_____ 6. Produce videotapes:

- Determine the location site for shooting your audio-visual message.

Lab Activity Sheet 4

- Make or obtain the props, costumes, and scenery required for your audiovisual message.
- Rehearse performers and production crew.
- Shoot videotapes on location.
- Shoot any additional videotapes required in the production studio.
- Record the narration, music, and special effects as needed and mix.
- Complete the final production (editing).

_____ 7. Show the final production to an audience.

_____ 8. Obtain feedback from the audience members by having them record any possible sources of interference on the "Interference Record Form" on Part B on page 86 on the worksheet.

_____ 9. Correct the source of interference and repeat Steps 6 through 8 as necessary until the message is successfully transmitted.

_____ 10. Return equipment and materials to proper storage.

_____ 11. Return your videotape to your instructor. Your instructor will rate your performance using the evaluation criteria listed in Part C on the worksheet.

Lab Activity Sheet 4

Worksheet—Produce and Transmit an Audiovisual Message

Name _____ Date _____

Part A: Pre-performance check

Complete the following information concerning the VCR equipment you will be using, and then, have your instructor sign on the blank line at the bottom of this page.

- In the space below, list the make and model of the equipment you will be using.

- Read the manufacturer's instructions for proper care and use of this equipment, and write a summary of these instructions on a separate piece(s) of paper.

- Describe any special equipment (lighting, sound-effect equipment, equipment to produce any special visual effects, etc.) that your group will use to produce this audiovisual presentation.

Instructor's signature _____

Lab Activity Sheet 4

Worksheet—Produce and Transmit an Audiovisual Message

Part B: Interference record form

Directions: Make several copies of this page to be handed out to your audience for them to use in evaluating the audiovisual message your group will transmit. You will use a copy of this page each time it is necessary to re-transmit the message. Write the number of each transmission attempt on the blank provided.

Attempt number _____

Source(s) of interference _____

_____

_____

_____

_____

Is message content effective and in good taste? Circle the appropriate response below.

Yes No

Is the sound portion of good quality and used effectively? Circle the appropriate response below.

Yes No

Is the video portion of good quality and effectively presented? Circle the appropriate response below.

Yes No

Is the overall production perceived as being of good quality? Circle the appropriate response below.

Yes No

Lab Activity Sheet 4

Worksheet—Produce and Transmit an Audiovisual Message

Part C: Performance evaluation

Evaluation criteria	Rating
Final audiovisual message follows script and storyboard created in Assignment Sheet 6.	_____
Sound (audio) portion of audiovisual message is recorded clearly and is used effectively in the message.	_____
Video portion of audiovisual message is recorded clearly and is used effectively in the message.	_____
VCR equipment was handled according to the guidelines in the manufacturer's instruction manual.	_____
Clean-up and follow-up actions were adequate.	_____
Overall rating	_____

Evaluator's comments _____

_____

_____